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The Veterinary Profession's Contribution To The World's Poultry And Egg Supplies*

J. R. BEACH, D.V.M.,** Davis, California

AS A BASIS for evaluating the contribution of the veterinary profession to the world's poultry and egg supply, I have chosen to present a brief account of the development and use of poultry disease control and prevention procedures that have taken place during the past 35 years. Since the invitation to present this topic was somewhat belated in coming to me, I have found it necessary to confine my remarks largely to developments in the United States. I am quite familiar with these accomplishments since my work has been exclusively concerned with poultry disease during the entire period. I trust that this will not be construed as minimization of the importance of the vast amount of excellent poultry disease research which has been done in other countries. In 1921, I was privileged to present at the World's Poultry Congress at the Hague a resumé of the knowledge of poultry disease control existent at that time. Comparison of this with present-day knowledge shows an impressive and creditable advance, nearly all through the work of veterinarians, has been made during the intervening years.

Previous to 1915, poultry disease received only sporadic attention by research veterinarians, whose chief interest lay in other fields. Nevertheless, some highly significant discoveries had been made. One was the observation of Dr. A. R. Ward, University of California, that avian tuberculosis, which was very prevalent in certain congested poultry-raising districts at the time, could be reduced by disposing of a large majority or all of a flock of chickens at the end of the first laying year and replacing them each year with young chickens which were reared apart from the older birds. He predicted in 1905 that by this practice the disease could be eradicated. This prediction proved so true that in the brief period of 15 years tuberculosis had disappeared from the district in which it had formerly been so plentiful. Since such annual turnover of the flock proved to be a sound practice for operators of specialized poultry farms, it was widely adopted and, as a result, tuberculosis is of rare occurrence on commercial poultry farms.

The discovery by Dr. L. F. Rettger, of Yale University, and the Connecticut Agricultural Experimental Station, in 1909, that pullorum disease, then known as white diarrhea or bacillary white diarrhea, is transmitted through the eggs of a mother hen to her offspring, is a particularly noteworthy accomplishment, because it was the first demonstration of disease transmission by this route. This, combined with the discovery by Dr. F. S. Jones, of the New York State Veterinary College at Cornell University, that the hens which are carriers of the infection can be detected by the agglutination

Lesions resulting from experimentally produced A-avitaminosis in the esophagus of a chicken.

*Presented at the 14th International Veterinary Congress, London, England, August 7-13, 1949.

**Professor of Veterinary Science, University of California.

test, paved the way for pullorum testing programs by which the lives of untold numbers of chicks have been saved.

More intensive study of poultry disease began in 1915 with the appointment of a veterinarian to the staff of the Department of Veterinary Science, University of California, to devote full time to poultry disease research. Similar appointments in other universities, experiment stations, and veterinary colleges, quickly followed and have continued. At present, there are hundreds of veterinarians whose entire, or major, interest lies in the field of poultry pathology. These men, for the most part, are members of the staffs of research and educational institutions, federal, state, or county livestock disease control organizations, or commercial veterinary biological laboratories. Unfortunately, most practicing veterinarians have shown disinterest in poultry. This has resulted in the application of disease control and prevention measures developed by those engaged in research being placed in the untrained hands of poultry owners. However, the increased emphasis on poultry disease instruction given to veterinary students is creating some improvement in this undesirable situation.

Symptoms of infectious bronchitis in a chick. This disease, principally affecting baby chicks, causes severe losses in young birds. The disease is ofttimes confused with laryngotracheitis because of the similarity of symptoms.

In research on poultry disease, emphasis has naturally been given to the development of control and preventive measures for those caused by viral, bacterial, or parasitic agents, although attention has also been given to maladies related to nutritional or genetic factors. Following is a partial account of the accomplishments in these fields.

Avitaminosis

Veterinarians have been prominently identified with the studies of livestock disease due to vitamin deficiencies, notwithstanding the fact that a major portion of the basic work has been done by biochemists. For example, it was a veterinarian, of the University of California Agricultural Experiment Station, who demonstrated, in 1919, that lack of vitamin A was the cause of a type of respiratory disease of poultry which had been confused with roup, the name then generally applied to coryza of chickens. This disease had been the cause of severe mortality in certain areas for several years whenever fresh greens, the principal source of vitamin A in the diet of affected flocks, became scarce. Once the cause of the disease was known, it was easily avoided. Dr. E. V. McCullum in his book, Newer Knowledge of Nutrition, states that this is the first demonstration of A-avitaminosis in farm animals which were fed upon a diet of natural foodstuffs.

Virus Diseases

Research on this group of diseases has been particularly active because of the ease with which they spread from farm to farm, the extremely high morbidity in affected flocks, and, with some of them, a high mortality as well, and their propensity to recur annually on many farms. Virus diseases to be discussed are fowl pox, infectious laryngotracheitis, infectious bronchitis, and avian pneumoencephalitis which is immunologically related to, and by many considered as identical with, Newcastle disease.

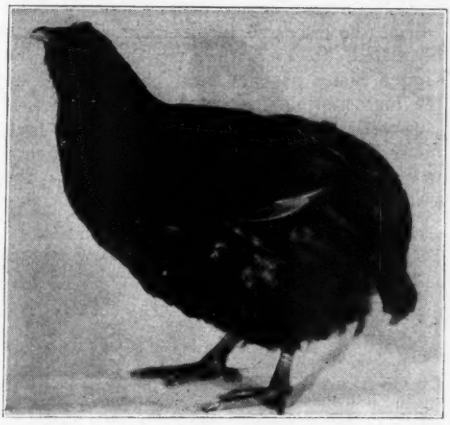
Fowl Pox: This disease was widespread in the United States in the early years of this century and caused a heavy annual loss on many farms. The writer recalls seeing owners of large flocks attempting to reduce their losses by laboriously picking the scabs from the comb lesions and canker from the oral or ocular mucous membrane of hundreds of affected birds. During 1913, the first experiments in vaccination against fowl pox were undertaken.

The vaccine first tried consisted of a suspension of finely ground comb lesions with a chemical added to inactivate the virus. It was injected subcutaneously. This vaccine, although variable in effectiveness, exhibited enough protective value to become extensively used in

certain areas. This is of particular significance because it marks the beginning of the acceptance by owners of poultry flocks of a disease control procedure requiring treatment of each individual regardless of the number of birds in the flock. It should be pointed out that it was not easy to convince poultrymen of the practicability of this procedure, which required not only handling each individual, but also making a hypodermic injection. Heretofore the belief had been held that the only proper way of giving medication of any sort to a flock of chickens was with the feed or drinking water. In 1923, the discovery was made that the application of virulent fowl pox virus to feather follicles on the leg from which the feathers had been plucked, or by pricking the skin with a pointed instrument moistened with virus, produced only a localized lesion of short duration. This brought into being the well known fowl pox vaccination method currently in general use, which has provided the means of reducing to negligible size the loss in both poultry and eggs from a disease that was once highly destructive.

Laryngotracheitis: This very acute, oftentimes fatal respiratory infection of chickens was first recognized as a disease entity in 1924 and the viral cause of it was demonstrated six years later. For several years the disease appeared to be confined to the United States, but it has since been identified in numerous other countries. In 1932, the remarkable discovery was made that virus applied to the mucosa of the cloaca or bursa of Fabricius produced localized infection of short duration which would not spread to the respiratory organs or otherwise adversely affect the birds, yet conferred solid, lasting immunity to the disease. This provided an effective means of vaccination and it received immediate acceptance in areas in which the disease had become established. By the time this method of prophylactic vaccination was developed, laryngotracheitis had become so prevalent and the income from infected flocks was so markedly reduced, that unless some means of preventing the disease had become available, it is doubtful that specialized poultry raising in many areas could have survived.

Infectious Bronchitis: This disease, first reported in 1931, was originally described as principally affecting baby chicks in which it caused severe losses. For a time, because of the similarity in symptoms, infectious bronchitis was confused with laryngotracheitis, but in 1936 the specific virus causing it was demonstrated. It was recognized later that baby chicks, growing chickens, and those of laying age were equally susceptible to the disease. Chickens affected during the growing period, that is, from four or five weeks to five or six months of age, suffer little mortality and their rate of development is not seriously retarded. In laying chickens, likewise, the disease is seldom fatal but it has a profound adverse effect on both the number and quality of the eggs which are laid.

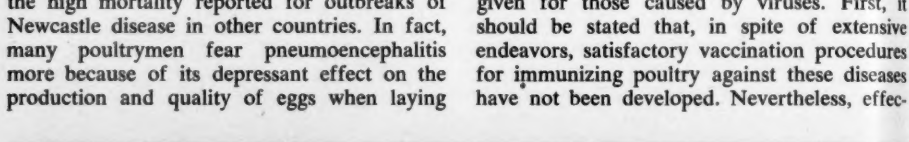


Laryngotracheitis is an acute, ofttimes fatal, respiratory infection of chickens, first recognized as a disease entity in 1924.

The decrease in income from infected laying flocks has been calculated to be at least one dollar per bird. This can easily represent the difference between profit and loss. It was for this reason that in 1941 an unusual procedure for immunizing chickens during the growing period was undertaken by research veterinarians in one state. This method consists in introducing infection into a flock of growing chickens by injecting virus into the tracheas of a few birds and depending upon the spread by natural means to infect the remainder of the flock. The procedure was restricted to farms on which the adult population previously had been affected with the disease and, therefore, was immune. Continued experimental application of this method of immunization against infectious bronchitis demonstrated that, under proper circumstances, it is both safe and effective. At present it is used on a large scale in several states in which the prevalence of the disease in laying pullets otherwise causes serious monetary loss to poultry raisers.

Avian Pneumoencephalitis (*Newcastle disease*): This disease was first recognized as one not hitherto observed in the United States in 1940. A year later the cause was shown to be a virus distinct from that causing either of the clinically similar diseases—infectious bronchitis and laryngotracheitis. In 1943, immunological relationship between this virus and Newcastle disease virus was demonstrated. Whether this phenomenon should be interpreted as indicating that the two diseases are identical or merely are immunologically related has been a controversial question, which will not be discussed further herein. It should be stated, however, that the disease in the United States has not been characterized by the high mortality reported for outbreaks of Newcastle disease in other countries. In fact, many poultrymen fear pneumoencephalitis more because of its depressant effect on the production and quality of eggs when laying flocks become infected than they do because of the mortality it causes. The disease has been identified in nearly all parts of the United States. Detection of it has been greatly aided by the fact that the hemagglutination test can be used in identifying the virus and the hemagglutination-inhibition test as a diagnostic procedure for birds which have recovered from the disease.

Experimental attempts to immunize chickens against pneumoencephalitis with formalin-inactivated virus were begun in 1942, and in 1945 commercial vaccine of this nature became available. This vaccine did not have wide application, however, because the protection afforded by it was incomplete and of relatively short duration. Veterinarians engaged in poultry-disease research, meanwhile, had been vigorously working to develop a live-virus vaccine which would be both safe and highly antigenic. These endeavors resulted in two live-virus vaccines becoming available from commercial biological laboratories (July 1948). The live-virus vaccines were immediately accepted by poultry raisers throughout the country and, when used under proper conditions, have, in general, yielded results which can be considered satisfactory. Unquestionably, pneumoencephalitis vaccination has already made an importantly significant contribution to the production of poultry and eggs.



Nervous symptoms in young birds caused by infection with the virus of avian pneumoencephalitis (Newcastle disease).

Bacterial and Parasitic Disease

Because of the limitations of time and space, the discussion of procedures for the control of this group of diseases will be briefer than that given for those caused by viruses. First, it should be stated that, in spite of extensive endeavors, satisfactory vaccination procedures for immunizing poultry against these diseases have not been developed. Nevertheless, effective and practical means for the control of those of greatest import have resulted from increase in knowledge and more objective application of sanitary measures, education of poultry raisers in the value of sanitary measures, thereby raising the level of sanitation on poultry farms, and epidemiological studies which have revealed vulnerable points at which the diseases may be attacked. Thus, by the systematic, standardized, and well-organized application of the agglutination test to flocks producing hatching eggs, and by incubator sanitation, the problem of pullorum disease in chickens and turkeys is now well in hand.

Diseases such as infectious coryza and endemic fowl cholera are usually brought onto a farm and perpetuated from year to year by birds with active or latent infection. The introduction of such diseases can be avoided by establishing the flock and making all additions

to it with day-old chicks. They can be eliminated from a farm to which they have gained entrance by simply disposing of the entire flock, by thorough cleaning and disinfection of buildings and equipment, restocking the farm with day-old chicks, and making all future additions to it in the same manner. Poultry raisers have found it a profitable move. The application of knowledge of the developmental and transmission cycles of parasitic agents such as helminths and protozoa has made it possible to prescribe sanitary measures, which are not too difficult for poultry raisers to observe, and by which serious loss from helminthiasis, coccidiosis, and enterohepatitis (blackhead) of turkeys can be avoided.

Many more illustrations could be given, but the above should suffice to show that the efforts of veterinarians to find means of reducing loss from the group of diseases under discussion have been fruitful.

Sulfonamide Therapy

Investigation of the merits of various members of this group of chemotherapeutic agents in the treatment of poultry disease has been vigorously pursued. Since repeated dosage is required for effectiveness, the only practical way of medicating poultry with them is with the food or drink. Those which have been tried out most extensively are sulfathiazole, sulfamerazine, sulfamethazine, sulfaquinoxaline, and sulfaguanidine. One, or more, of these has been found of value for the treatment of flocks affected with acute infectious coryza, fowl cholera, fowl typhoid, and pullorum disease in chicks, and for both intestinal and cecal coccidiosis. They have proved most effective when treatment was begun in the initial stages of an outbreak. Chronic poultry disease has not responded to treatment. The bacterial infections have tended to recur when treatment was terminated. The drugs have probably been most widely used in the control of coccidiosis in young chickens. While such therapy has undoubtedly been of great value, it has not as yet proved to be an entirely satisfactory substitute for sanitation.

In the foregoing, an attempt has been made to show that, by the development of measures for prevention and control of diseases of poultry, veterinarians have made contributions of incalculable value to the conservation of the world's supplies of poultry and eggs. It is probable, however, that even greater good would have been accomplished if the application of these measures had been directed by veterinary practitioners instead of being, for the most part, left in the hands of poultry raisers. Another point of criticism is that livestock disease control officials have shown less concern regarding poultry diseases than those of other farm animals. In fact, until relatively recent years, poultry was not even included in the laws and regulations under which many of these federal and state officials operated. Consequently there has been little restriction to the movement of live poultry and it is a well established fact that by this means disease has been disseminated great distances with devastating results. There has been lack of control of the distribution of live-virus vaccines by which an uninformed poultry raiser can unwittingly bring onto his farm disease with which he previously did not have to contend. Avian pneumoencephalitis, reported in 1941 as an hitherto unidentified virus disease of poultry, was ignored by livestock disease control officials until its relation to much-feared Newcastle disease was established.

In concluding, permit me to repeat that veterinarians have made laudable contributions to the world's poultry and egg supplies, and to emphasize that their contribution undoubtedly would have been greater if the attack on poultry disease had had the interest and support of all segments of the veterinary profession. It is to be hoped that in the future students will emerge from the veterinary colleges well grounded in the principles and procedures of poultry-disease control; that the practicing veterinarians and livestock disease control officials will recognize that in monetary value poultry and poultry products compare favorably with those of other types of farm livestock and, therefore, merit attention. It is the duty of the veterinary profession as the guardian of the health of farm livestock, to render service to poultry equal to that given to other types of farm animals. Finally, I wish to again point out that the contents of this paper are based on developments in poultry disease control in the United States alone and I wish it to be clearly understood that the criticisms expressed are not directed toward the veterinarians of any other country.

▼ ▼ ▼

One of the first jobs assigned to the Department of Agriculture's newly created Weed Division is clearing the Mexican border of the heavy brush that is impeding horse and jeep patrols on quarantine duty against foot-and-mouth disease.—*S.N.L.*

An Outbreak Of Bovine Leptospirosis In Pennsylvania

RALPH B. LITTLE, V.M.D.,* JOHN D. BECK, V.M.D.,**
JAMES V. McCAHON, V.M.D.***

BOVINE leptospirosis was first recognized in this country in 1944 when Jungherr[1] reported three fatal cases in dairy cows in Connecticut. Since then spirochetal† infections in cattle have been observed by Marsh[2] in Montana, Mathews[3] in Texas, Baker and Little[4] in New Jersey, and Sutherland and Morrill[5] in Illinois. In four of these reports, a diagnosis was made by the demonstration of the organism in stained tissue sections of the liver and kidneys from guinea pigs inoculated with infective material or directly from the organs of natural cases which had died. Baker and Little[4], on the other hand, isolated pure cultures of the organism from the blood of guinea pigs inoculated with infective material from sick cattle. More recently these authors[6] reported in greater detail the clinical signs of the disease in cattle and reviewed the practical application of a number of tests which can be employed for the diagnosis of the infection. They showed that the blood, milk, and occasionally the urine, are infectious for the natural host and readily cause signs of illness and lesions in guinea pigs and hamsters. Moreover, it was pointed out that at the onset of the disease, the blood of cattle usually fails to agglutinate or lyze suspensions of the Leptospira, but following recovery these tests are positive. As a routine diagnostic measure, it was recommended that all infected cattle be bled during the acute phase of the disease and again after recovery and that these serological tests be made. When facilities are not available for the direct examination of material from affected cases, a retrospective diagnosis can be made by the serological examination of the blood for the presence of agglutinins against the Leptospira.

Apparently an unrecognized outbreak of bovine leptospirosis occurred in Pennsylvania in 1945, for Allam and Beck[7] reported their clinical findings on a condition of cattle in which the most outstanding symptom was a non-specific hemoglobinuria. This abnormality occurred in herds of Philadelphia, Chester, Bucks, Delaware, and Montgomery counties in Pennsylvania during the summer and fall of 1945. The disease was characterized by hemoglobinuria, severe anemia, slight icterus, fever, pink milk, decreased milk production, abortion, moderate constipation, anorexia, and loss in weight. The morbidity varied from 10 to 50% in different herds, while the mortality rate was around 3%. In April of 1948, five cows in one of the herds involved in the Chester county outbreak of 1945 were bled. The sera from three animals had specific antibodies for the Leptospira isolated by Baker and Little[4] from sick cattle in New Jersey. This was the first indication that possibly a Leptospira was the etiological agent in this outbreak.

The purpose of this presentation is to describe an outbreak of bovine leptospirosis which occurred in Pennsylvania during the summer and fall of 1948 in which agglutinins were demonstrated in the blood of recovered cattle and the organism was isolated from blood or milk of two affected animals on different premises. The disease was recognized on seven farms, involving 33 head of cattle.

History of the Outbreaks

The disease did not recur in Pennsylvania until July of 1948. Since the symptoms presented by the sick cattle were similar to those observed by Allam and Beck[7] in 1945, a tentative diagnosis of bovine leptospirosis was made. In order to obtain more information regarding the epidemiology of the disease occurring in

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†The classification of organisms with spirals is most uncertain and confused. In the last edition of Bergey's Manual of Determinative Bacteriology (The Williams & Wilkins Co., Baltimore, ed. 6 [1948]:1051) they are all grouped under the order Spirochaetales, which is divided into two families, Spirochaetaceae and Treponemataceae. The former includes forms with many spirals and some internal structures, while the latter includes shorter forms with fewer spirals that are more tightly coiled. The aerobic forms in the latter family are in the genus Leptospira, and therefore the organisms (Fig. 1 and 2) that we are describing fall into this genus. The term "spirochete" is a more general one and is used for many of the forms in both families.

Chester and Montgomery counties, one of us (J. V. McC.), a practitioner, instructed his clients to take the temperatures of all sick cattle, including cows with thick milk in which the udders were soft and limp. Furthermore, they were asked to observe the urine for the presence of hemoglobinuria. With this cooperation it was possible to obtain fairly accurate histories and to treat the animals promptly as they sickened. The general symptoms in the affected cattle were fever, anorexia, depression, abortion, and a thick, viscid, yellowish secretion from a soft and limp udder. Hemoglobinuria was observed in over 50% of the clinical cases.

From early in August through September, all attempts to establish the infection in guinea pigs and hamsters failed, so that the diagnosis of leptospirosis was questioned. In no instance, however, was material obtained for inoculation from a sick animal with a temperature of 103 F. or above.

It was decided that, before any further investigation of this disease of cattle was carried on, the blood of recovered animals should be examined serologically to determine if agglutinins were present in their sera for the bovine Leptospira. On September 30, a group of 19 cows, two heifers, and two calves which had recovered from the disease (six farms) were bled. The results of the agglutination test are submitted in table I.

As can be seen in table I, 19 of the 23 sera examined gave positive results, indicating that the blood of these animals contained specific agglutinins for the spirochete. It is of particular interest that a previous sample of blood obtained from cow 15, herd V, at the onset of the disease was negative, but a second sample obtained (21 days later) at the time the recovered cattle were bled, reacted in 1:20,000 dilution. The results of the serologic test suggested that the etiological agent in this disease was a Leptospira. Obviously, in order to confirm the diagnosis, it seemed necessary to isolate the organism from sick cattle. Early in October, eight guinea pigs from the Princeton stock were sent to Doctor McCahon to be taken to the farms for inoculation whenever new cases developed. Immediately after the guinea pigs were injected at the farm they were to be expressed to the Institute so that daily temperatures could be taken. Doctor McCahon was advised not to inoculate these guinea pigs unless the affected cattle were acutely sick with temperatures of 103 F. or above.

The results of the animal inoculations and the clinical and serological findings in each herd will be discussed separately in the order presented in table I.

Herd I

A purebred Guernsey herd consisting of 35 animals: Early in August a cow became ill, presenting typical signs of the disease. The udder was limp and the milk thick and viscid. On November 17, another cow showed similar symptoms. The temperature of this animal was 104.6 F. Two guinea pigs from the Institute stock were taken to the farm and inoculated intraperitoneally with 1 ml. of whole blood and 1 ml. of thick viscid milk, respectively, from this animal.

The guinea pigs were immediately expressed to Princeton where daily temperatures were taken. Both guinea pigs became febrile on the fifth day and were bled on the following day. A pure culture of Leptospira was isolated from the blood of these guinea pigs and the organism is being maintained by serial passage in guinea pigs.

TABLE I.—THE RESULTS OF THE SEROLOGICAL EXAMINATION OF THE BLOOD OF RECOVERED CATTLE.

No. of Herd	No. of Animal	Lysis 1:20	1:200	1:2,000	1:20,000
I	C* 1	+**	+	—	—
II	C 2	+	+	+	+
	C 3	+	+	+	—
	C 4	+	+	+	—
	C 5	—	—	—	—
III	C 6	+	+	+	±
	C 7	+	+	+	±
	C 8	+	—	—	—
	C 9	+	+	+	+
IV	C 10	+	+	+	—
	C 11	+	+	+	—
	H 12	+	+	+	+
	H 13	+	+	+	+
V	C 14	+	+	+	±
	C 15	+	+	+	+
	C 16	+	+	+	±
	C 17	+	+	+	+
	C 18	+	+	+	±
	C 19	+	+	+	—
	C 20	+	+	+	+
VI	C 21	+	+	+	+
	Ca 22	±	—	—	—
	Ca 23	—	—	—	—

*C = cow, H = heifer, Ca = calf.

** + signifies all organisms lyzed; ±, many organisms lyzed, —, no lysis.

The cows were treated and both recovered.

Although only two clinical cases were observed in this herd during the entire season, the serological examination of herd samples of blood showed that 11 additional animals had unapparent infections.

Herd II

A small mixed herd (29) of Jersey, Holstein, and Guernsey cattle: In August, cow no. 2 sickened. The symptoms were fever, hemoglobinuria, anorexia, and a thick, viscid, yellowish secretion from a limp udder. She aborted during the early course of the disease. Cows no. 3 and 4 were not severely ill, yet each animal aborted. Another cow (no. 5) calved prematurely, but there was no history that she had been sick. Of the four sera tested from this herd, the only negative sample was the serum from cow no. 5.

The serological examination of herd samples of blood showed that, in addition to the four recognized cases, 12 other animals had unobserved infections.

Herd III

A small purebred Guernsey herd in which two animals were severely affected: One cow died, while the other, a hopeless case, was destroyed. Shortly before the cow died (temperature subnormal), a sample of citrated blood was inoculated into two hamsters and two guinea pigs. The symptoms in both cows were fever, jaundice, hemoglobinuria, and bloody milk. An autopsy was performed at the University of Pennsylvania Veterinary Hospital on the cow that was destroyed. The outstanding lesions were jaundice, petechiae on surface of epicardium, bloody pericardial fluid, and subcapsular hemorrhages in both kidneys.

The day after this cow was destroyed, a stallmate sickened. This latter animal was treated promptly and made a complete recovery.

Herd IV

A large purebred herd of Guernsey cattle maintained in separate units on three different farms: A single cow in two of the units and two heifers at the young stock farm had the disease. The symptoms in the cows were typical, while the chief signs observed in the heifers were fever and hemoglobinuria. These four animals were the only clinical cases observed on this stock farm, consisting of 50 cows and young stock.

Herd V

A purebred herd of Holstein cows of over 40 milking animals: In July, the first case of leptospirosis was recognized in a cow showing typical signs of the disease. From July to early in August, three more cows became ill. On August 10 cow no. 15 sickened. The owner stated that on the previous day a few small clots of blood were detected on the milk strainer pad. The symptoms were anorexia, mild depression, and a yellowish, watery secretion from a limp udder. The temperature was 102.8 F., and the urine appeared normal. Six guinea pigs transported from Princeton were inoculated with the blood, milk, and urine. None of the pigs became sick and, when challenged three weeks later with the New Jersey culture, all reacted. A sample of blood from this cow on August 10 was negative; whereas sera obtained 21 and 81 days later, respectively, had titers of 1:20,000. Of the seven clinical cases of the disease, hemoglobinuria

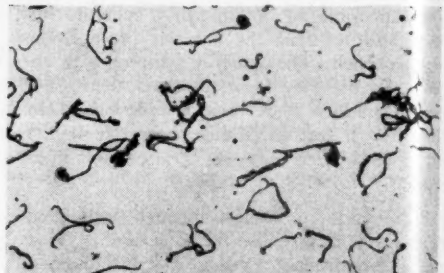

Fig. 1. Preparation of spirochetes (X2267) from culture stained by Morosow's method.

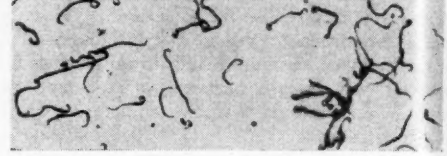

Fig. 2. Electron microphotograph of spirochete (X23,200) that shows usual unit of size, 90 millimicrons in diameter and 4 microns long.

was observed in only two cows. Forty milking cows in this herd were bled on November 30, and the sera from only 20 animals failed to lyze suspensions of the spirochete. In addition to the seven clinical cases, 13 other cows apparently had mild unapparent infections not detected by the owner.

Herd VI

Small herd of purebred Guernsey cattle: In September, a typical case of the disease was observed in a cow in milk. The animal was febrile, depressed, off feed, with hemoglobinuria. The milk was thick and viscid. On September 31, this cow and two young calves, no. 22 and 23 (three to four weeks of age), were bled. The young animals had a history of hemoglobinuria a few days prior to the visit. Samples of blood obtained from these calves at this bleeding and 60 days later failed to lyze suspensions of the spirochete. Since the disease had occurred in an adult animal in this herd (blood + 1:20,000), it seemed logical to assume that the hemoglobinuria in the calves could be attributed to the same etiological agent, regardless of the negative reaction of their sera. It is realized that young animals under four months of age may not be capable of forming antibodies in their blood for specific microorganisms until they become more mature. In another disease of cattle, caused by *Brucella abortus*, repeated inoculations of living cultures of the organism may fail to initiate any response in the blood of the young calf to the production of antibodies. Apparently, young animals that are immune fail to show agglutinins in their blood.

Herd VII

This herd was not included in table I, for on the day the recovered cases were bled, the farm was not visited on account of distance. In August, a cow died which had shown typical symptoms of the disease. This animal was not treated. Later six other cattle, including a bull, contracted the infection. This latter animal sickened on November 1 with a temperature of 107 F., depression, anorexia, and hemoglobinuria. It was treated promptly but did not fully recover until ten days later. Guinea pigs were inoculated intraperitoneally with 1 ml. of whole blood from this animal at the onset of the disease. They were expressed to Princeton and on the sixth day became febrile and were bled from the heart. At this bleeding a pure culture of the Leptospira was isolated from their blood, and since then the organism has been maintained in guinea pigs by serial passage. This herd was kept under very poor sanitary conditions, so it was felt that the serological examination of herd samples of blood would reveal a high incidence of unapparent infection. This deduction was not substantiated, for of the 21 adult animals and two yearlings tested, only four sera, in addition to the blood of the six recovered cases, had positive titers.

Comparison of Strains of Leptospira Isolated from Cattle in New Jersey and Pennsylvania

It has been demonstrated[4] that the Leptospira isolated from cattle in New Jersey caused typical signs of illness and lesions in guinea pigs. Fever developed three to five days following the inoculation of infective material, and at autopsy, characteristic lesions were encountered, such as scattered petechial hemorrhages in the lungs and small whitish spots in the liver (cell necrosis). Occasionally, subcapsular hemorrhages appeared in the kidneys. The inoculations rarely resulted in the death of the guinea pig and recovered animals were solidly protected against challenge inoculations with infective material.

The two strains of Leptospira isolated from Pennsylvania cattle produced reactions and lesions in guinea pigs undistinguishable from those already observed[6]. Guinea pigs which had recovered from the inoculation of blood or milk from affected cattle in Pennsylvania were protected against the reinoculation of homologous strains. Cross-infection experiments in guinea pigs with both the Pennsylvania and the New Jersey strains showed that one culture would fully protect against a challenge inoculation with the other strain. Moreover, when sera from recovered cattle were tested by agglutination, both strains had the same limiting titer.

Bernkopf and Little[8] compared the New Jersey organism with a typical Leptospira culture isolated from an infected cow in Palestine. The two cultures differed not only in their pathogenicity for guinea pigs but in their antigenic properties as well, indicating that the Palestine strain belonged to another serological group.

The sera from a number of recovered cattle from New Jersey and Pennsylvania were tested by agglutination against their respective strains and the Palestine culture. The results of this test are given in table II.

It will be noted in table II that the sera from 23 recovered animals (Pennsylvania and New

Jersey) reacted in about the same dilutions with both strains but not at all, or in a low titer, with the Palestine culture. Thus, it would appear that the New Jersey and Pennsylvania strains of Leptospira belong to the same antigenic group.

Treatment

In outbreaks of bovine leptospirosis, no experimental data are available concerning the value of treatment with drugs and various antibiotic agents in which treated animals and controls have been studied during the natural course of the disease. For this reason, it is not possible for us to evaluate the results of treatment with penicillin and sodium sulfathiazole administered by one of us (J. V. McC.) in the outbreak occurring in Pennsylvania in 1948.

In Weil's disease[6], (spirochetal jaundice in man; new term leptospirosis) transfusion with whole blood from donors who have recovered from the disease is considered the best single step in the treatment of a patient severely ill. On the other hand, it has been shown that in this disease the various sulfonamide compounds are of little value, whereas penicillin has a lethal as well as an inhibitory effect on the multiplication of the Leptospira. Moreover, when the parasite is being shed in the urine, the administration of penicillin has been very effective in eliminating the organisms from the kidney.

It has been suggested by Little and Baker[5] that chronic cases of the disease in cattle may serve as natural carriers of the infection. Thus, cattle may be actual vectors and hosts of the infection from one season to another, for it has been shown[4] that animals with nephritis shed the organism in the urine for long periods. When sick cattle are no longer febrile and the acute signs of the disease have subsided, they may not be carriers of the infection unless there is hemoglobinuria or albuminuria. Hence medication should be administered not only to hasten recovery but to eliminate carriers of the infection, for bovine lepto-

TABLE II.—LYSIS TESTS WITH IMMUNE SERA OF CATTLE AGAINST THE NEW JERSEY, PENNSYLVANIA, AND PALESTINE STRAINS OF LEPTOSPIRA

Location of Cattle	No. of Herd	No. of Cow	New Jersey				Pennsylvania				Palestine			
			1:20	1:200	1:2,000	1:20,000	1:20	1:200	1:2,000	1:20,000	1:20	1:200	1:2,000	1:20,000
New Jersey	I	1	+*	+	+	+	+	+	+	+	—	—	—	—
		2	+	+	+	+	+	+	+	+	—	—	—	—
		3	±	±	+	+	+	+	+	+	—	—	—	—
	II	1	+	+	±	+	+	+	±	±	±	—	—	—
		2	+	+	±	+	+	+	±	±	—	—	—	—
	III	1	+	+	+	+	+	+	+	+	—	—	—	—
		2	+	±	+	+	+	+	+	+	—	—	—	—
		3	+	+	+	+	+	±	+	+	—	—	—	—
	IV	1	+	+	+	+	+	+	+	+	—	—	—	—
Pennsylvania	II	1	+	+	+	+	+	+	+	+	—	—	—	—
		2	+	±	+	+	+	+	±	±	—	—	—	—
	III	1	+	+	+	±	+	+	+	±	±	—	—	—
		2	+	+	+	+	+	+	+	+	—	—	—	—
		3	+	±	+	+	+	+	+	+	—	—	—	—
	IV	1	+	+	+	+	+	±	+	+	—	—	—	—
		2	+	+	+	+	+	+	+	+	±	—	—	—
	V	1	+	+	+	+	+	+	+	+	—	—	—	—
		2	+	±	+	+	±	±	±	+	—	—	—	—
		3	±	+	+	+	+	+	+	+	—	—	—	—
	VI	1	+	+	+	+	+	±	+	+	—	—	—	—
	VII	1	+	+	+	+	+	+	+	+	—	—	—	—
		2	+	+	+	+	+	+	+	±	±	—	—	—
		3	+	+	+	+	+	+	+	+	—	—	—	—

*See footnote to Table I.

spirosis is not only an economic disease of livestock but one of public health significance since some types of the bovine organism have been shown to be infective for man[10, 11]. Obviously, general treatment should be directed toward the control and eradication of this disease of cattle and therefore the following suggestions may be worthy of consideration:

1. The herd should be quarantined and each affected animal isolated during the acute stages of the disease and for at least a week following recovery. In addition, daily temperatures should be taken and each sick animal should be observed carefully for jaundice, hemoglobinuria, abortion, and changes in the character of the secretion from the udder.

2. The transfusion of whole blood (500 cc. or more drawn into sodium citrate) from donors that have had the disease should be beneficial‡. Moreover, whole blood from normal cattle may be used when donors are not available, to replace the red blood cells and other constituents of blood depleted by the disease. The transfusion of whole blood can be repeated whenever necessary.

3. The administration of penicillin from the first day of illness is recommended. Other antibiotics and drugs should be tested for the elimination of carriers.

4. Since kidney damage (hemoglobinuria, etc.) frequently occurs, an acid urine may retard the multiplication of the Leptospira in the kidney. The daily administration of methenamine and sodium biphosphate while the animal is sick and for at least ten days after recovery, may maintain an acid condition of the urine during the critical period.

5. The effectiveness of any line of therapy is enhanced if the treatment is administered soon after the first symptoms are recognized.

Discussion

In bovine leptospirosis, the signs of illness in cattle may be so variable that many outbreaks may be missed unless the practitioner is fully cognizant of the symptomatology. In either the severe or mild form of the disease, the onset is sudden. Frequently the owner states that on the preceding day the cow was slightly depressed with inappetence and a drop in milk yield.

‡The disease appeared again in this section of Pennsylvania during the summer and fall of 1949, yet none of the dairy herds affected in 1948 were involved in this outbreak. One of us (J. V. McC.) transfused a number of acutely sick cattle with whole citrated blood (500 cc. or more) obtained from dairy animals that had shown clinical signs of the disease in 1948. This form of medication was the most satisfactory treatment employed thus far, since the natural course of the disease was shortened.

The severe form, in which animals are depressed, often prostrated with fever, associated with icterus, hemoglobinuria, pink milk, and abortion, should be less difficult to diagnose than the mild form of the disease in a herd where only a single cow or two during the entire season becomes ill. As a rule, in mild outbreaks, fever and depression of short duration in cattle are often attributed to indigestion or to some unknown condition but rarely to this disease. If cows which are depressed, with anorexia and fever, are carefully observed by the dairyman, other symptoms of clinical significance may be recognized to assist in the diagnosis. With the exception of fever, depression, and a marked drop in milk yield, the most consistent symptom observed by one of us (J. V. McC.) was a thick viscid secretion from a limp udder resembling the gland of a dry cow. Three of the affected cows had bloody milk; two of them died, while the third animal, a hopeless case, was destroyed. These were the only cattle that were icteric or had a typical bloody secretion from the udder.

In previous work on leptospirosis in cattle in a New Jersey herd, bloody milk was a more constant abnormality than a thick viscid secretion. It would seem, therefore, that in this disease the milk from a limp udder may be either bloody or thick and viscid. Hemoglobinuria, a characteristic feature of the infection in young cattle, did not occur as frequently in adult animals. Abortion, another sign of the disease, may occur while the animal is sick or after recovery.

In the outbreak of leptospirosis in Pennsylvania, a tentative diagnosis was first made by the serological examination of the blood of recovered cattle. Later the diagnosis was confirmed by the isolation of the organism from the blood or milk of two clinical cases situated on different farms. These strains were similar in their pathogenic and antigenic properties to the organism isolated in a New Jersey dairy herd, and obviously the same serological strain responsible for an outbreak of the disease in the New Jersey herd in 1946 was the etiological agent in outbreaks occurring in Pennsylvania during the summer and fall of 1948.

The cultures isolated from cattle in New Jersey and Pennsylvania can be regarded as a typical bovine strain, since at present there is no indication that the organism is pathogenic for man. On the other hand, the bovine Leptospira isolated from cattle in Palestine[10, 11] is also pathogenic for man. Outbreaks occurring in this country should therefore be regarded

as dangerous to human beings, and the herds quarantined until the organism is typed.

Summary

A report is submitted of an outbreak of bovine leptospirosis that occurred in Pennsylvania on seven different farms during the summer and fall of 1948.

A positive diagnosis was made by the serological examination of the blood from recovered cattle and the isolation of the Leptospira from guinea pigs injected at the farms with blood or milk from natural cases.

By serological tests and cross-examination experiments with guinea pigs, it has been shown that the strains from Pennsylvania and New Jersey belong to the same antigenic group.

It is pointed out that at present there is no evidence that the bovine Leptospira isolated from cattle in New Jersey and Pennsylvania is pathogenic for man. Since some strains have been responsible for disease in human beings, any outbreak in cattle should be regarded as potentially dangerous to man until the organism is classified.

Appendix

While this outbreak of bovine leptospirosis was being studied, one of us (J. V. McC.) observed three horses that were jaundiced, febrile and weak. In two of the animals, the eyes were swollen and the pupils cloudy, with a marked watery lacrimation, followed by blindness. Since the signs of illness shown by the three horses were similar in many respects to those observed in cattle, a tentative diagnosis of leptospirosis was made. After the horses recovered from the acute illness, they were bled and their sera reacted in a 1:200 to 1:2,000 dilution with both the New Jersey and Pennsylvania strains but not at all with the Palestine culture.

Since it seemed likely that horses in contact with cattle might contract leptospirosis, samples of blood were obtained from 29 horses from six different dairy farms. The sera from eight reacted in high dilutions (New Jersey and Pennsylvania cultures), yet none of the animals had a previous history of any infections resembling the illness observed in the three horses noted above.

From a large stud farm where blindness and abortion are frequent, numerous samples of sera from brood mares and colts have been tested for immune bodies against the Leptospira. Many of these sera were positive in high dilutions to the New Jersey and Pennsylvania strains, and some agglutinated the Palestine strain in low dilutions. There is a close correlation between the results of the serological tests and the presence of the clinical abnormalities noted, but some of the positive animals have shown no such abnormalities.

So far the few attempts to isolate the organism from horses have been negative. These studies are being continued, for, in agreement with *Heusser, et al.*[12], it is recognized that the positive serological results do not prove that the Leptospira is the cause of the abnormalities noted.

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A preliminary report (Gibson, in *The Veterinary Record*) indicates the value of daily 1gm. doses of phenothiazine in the feed in reducing greatly the numbers of palisade worms *(Strongylus equinus)* in the intestinal tract of horses, with a correspondingly reduced fecal egg count, and of the larval count in pastures used for their grazing. There was no observed evidence of toxicity. Though the research has not been completed, it is hinted that on a theoretical basis horses and pastures may be freed of infestation by this method of medication. See also *Vet. Med.*, 44:411-461, 1949.

Clinical Application Of The Reinsch Test: A Rapid Preliminary Method For Identification Of Arsenic

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ARSENIC poisoning according to Milks[1] is one of the most common found in veterinary practice. Arsenic is widely diffused in nature as sulfides of arsenic (orpiment, As_2; realgar, As_2S_2), and arsenical pyrites ($FeAsF_2S_2$) in ores. It is found as an alloy with other metals, as NiAs, $CoNiAs_2$; as an arsenate in cobalt bloom $Co_3(AsO_4)_2$; and in a great variety of minerals.

Udall[2] states that arsenical poisoning which is usually present in the acute form is due, as a rule, to sodium arsenate, sodium arsenite, arsenic trioxide (white arsenic), or Paris green (acetoarsenite of copper). He further states that in his experience cases of arsenical poisoning usually have been caused by Paris green. Careless handling of arsenical grasshopper bait (sodium arsenate) has been the chief cause of poisoning in Kansas.

Poisoning of animals by arsenic may occur as the result of the irresponsibility and carelessness of persons using it as a spray for fruit trees or as a weed-killer, causing contamination of forage; as arsenical dips for ticks and mange mites, and as rat poisons, stock remedies, and insecticides. Access to arsenic may come about by careless dumping of the poison in pastures or by improper disposal of the mixing containers. It may be caused by medicinal overdosage or erroneous administration. In some instances arsenic has been maliciously given with the intent to kill.

More work has been done on the diagnosis of arsenic poisoning than on any other heavy metal poisoning. As a result, there are various tests for the detection of arsenic—Reinsch test, Gutzeit test, Marsh test, biological test employing Penicillium brevicaule, and others. However, it is thought by the writers that the Reinsch test is less complicated and as a preliminary test more applicable than other tests. Because of the rapidity with which it can be conducted, it is thought to be of especial value to the veterinarian. Several case histories of poisonings are presented wherein this test was applied and confirmed in the toxicological laboratory. The Reinsch test as a rapid preliminary method for the identification of arsenic has been reported by Smits and Barner[3].

Hugo Reinsch[4], in 1838, reported that if a piece of copper is boiled in a dilute hydrochloric acid solution of suspected material (ingesta, feces, etc.) a shiny black deposit of copper arsenide forms on the copper in the presence of arsenic. Similarly, mercury, antimony, silver, and bismuth, if present, will be deposited. No preliminary digestion of the viscera or excreta with acids is necessary, for this test can be performed in the presence of organic matter. Routine analyses in toxicological laboratories include the Reinsch test for common heavy metals.

There are but two reagents used in this test —copper and hydrochloric acid. To eliminate the possibility of arsenic being an impurity in the reagents used, a blank test should be performed by boiling the copper strip in the dilute hydrochloric acid, the copper previously having been cleaned with nitric acid (burnishing with steel wool will suffice) and rinsed with water. If after boiling for 15 minutes the copper remains bright, it can be assumed that the reagents are satisfactory. It is necessary to conduct this blank run but once for each lot of reagents.

About 25 gm. of stomach, liver, or other substance to be tested, is placed in a clean Erlenmeyer flask or beaker (a porcelain dish or casserole may be used). To this add 10 cc. of concentrated hydrochloric acid in 90 cc. of distilled water. Introduce into the flask a strip of bright pure copper-foil (or 20 gauge copper wire wound to a length of ½ inch, leaving a straight portion to serve as a handle).

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[1]Contribution No. 110 from the Department of Veterinary Medicine and No. 392 from the Department of Chemistry, Kansas State College.

The container is covered with a flask filled with cold water so that the boiling may be prolonged without loss of water or of arsenic by volatilization as arsenous chloride. Allow the mixture to boil gently for a period of 15 to 30 minutes.

Remove the copper, wash it thoroughly with water, and let dry. A discoloration or coating of the copper is presumptive evidence of the presence of the heavy metals—arsenic, mercury, antimony, silver, or bismuth. Under certain conditions the copper may become dark in color due to the presence of sulfides in fecal material or decomposed organic matter. A negative test is indicated by a copper or reddish colored metal. If arsenic is present, the discoloration or coating of the copper will

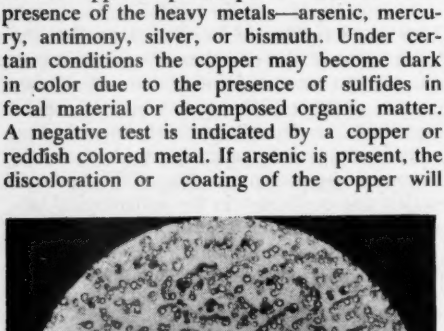

Fig. 1. The Reinsch test for arsenic. Note the characteristic glistening octahedral and tetahedral crystal of sublimate of arsenic.

be steel-grey to greyish-black in appearance due to the formation of copper arsenide. When the coating is at all considerable, that of antimony has a purplish-black to black appearance; of bismuth, black; and of mercury and silver the grey or silvery lustre of those metals. The presence of arsenic is proved by crystallization upon sublimation.

To prove that this deposit is arsenic, place the coated copper in a small test tube 10 cm. long by 12 mm. wide and heat gently at the lower end of the tube. Upon heating, arsenic forms on the cooler portion of the tube a characteristic sublimate of glistening octahedral or tetrahedral crystals (see Fig. 1) which may be identified under magnification. The sublimate of antimony is amorphous or non-crystalline, or, upon occasion, forms acicular crystals. Mercury will volatilize or sublime to form silvery globules of liquid metal and upon microscopic examination will reveal the characteristic silvery globules of mercury which show highlights under reflected light. Bismuth is oxidized but not volatilized, and silver remains unchanged by heat.

No reports of poisoning in domestic animals due to silver, bismuth, or antimony have been found in literature. Suspected mercurial poisoning in steers from feeding seed corn that had been treated with a mercury fungicide has been reported by Boley, *et al.*[5]. Stevens[6] reports three cases of mercurial poisoning in cattle treated for lice by farmers. Taylor[7] has observed several deaths in cattle wherein a tentative diagnosis of mercury poisoning was made. He also reported the resultant illness and death of nine hogs which had eaten seed corn treated with an organic mercury seed protectant. No gross postmortem lesions were observed upon autopsy of the hogs. In one field investigation involving overfeeding of cattle, the authors found antimony in the intestine and its contents for which no explanation could be given. It was apparently of no significance.

We have used the Reinsch test repeatedly in the laboratory and also in the field in cases of suspected heavy metal poisoning. In one case presented to our clinic involving the death of nine six-to-eight-week old dairy calves wherein the animals had died suddenly, the farmer reported the symptoms prior to death to be as follows: scouring, distress, sunken eyes, off feed, nervous disturbances consisting of stupor and paralysis, and irregular rapid respirations. The hemogram on one live calf presented to the clinic showed the red blood cell count to be 13,850,000; white blood cell count, 2,300; eosinophiles, two; segmenters, five; lymphocytes (large, six; atypical, two; small, 78) 86; monocytes, two; hemoglobin, 15 gm. Two nucleated red blood cells were observed. Apparently the increased red blood cell count was due to the stimulation of arsenic. Postmorten findings on the first dead calf presented to our clinic showed an acute catarrhal gastroenteritis. The gross appearance of the visceral organs was normal, but upon microscopic examination later showed parenchymatous degeneration. Due to the preservative quality of arsenic, it has been noted that the liver and other organs frequently do not show the postmortem changes that normally might be expected. Portions of the true stomach, duodenum, and liver were saved for toxicological examination. The following day

the same owner presented another dead calf, which, upon autopsy, showed an acute hemorrhagic gastroenteritis. As before, portions of the true stomach, duodenum, and liver were taken for toxicological examination. Significant amounts of arsenic were found in the viscera of the two calves. It is to be noted that while the organs of both calves showed equal amounts of arsenic, the accompanying inflammation varied in each case.

Interrogation of the owner did not give any indication of the source of arsenic in this case. The authors visited the farm to make a personal survey of the conditions. It was thought the arsenic was present in the barn, since the calves had been confined to that area, but when the poison could not be found there, the removal of three inches of topsoil was suggested. The farmer did not follow the suggestion, and ultimately lost the three remaining calves. A month or two later this same client presented one dead hog and several sick ones to our clinic, the history revealing that they had been housed in the suspected barn. Upon autopsy, the dead hog showed hemorrhagic gastritis and catarrhal enteritis. The stomach and its contents showed the presence of large amounts of arsenic as detected by the Reinsch test. The owner finally concluded that the source of his trouble lay in the earthen floor of the barn; but instead of removing topsoil, as suggested, he is going to pour a three-inch concrete floor.

The Reinsch test cannot be used for quantitative work. The sensitivity for arsenic is approximately 1:50,000. When a 25 gm. aliquot is used, this sensitivity is such that a negative finding means that the amount of arsenic present is not significant. It is suggested that for verification in cases of arsenic poisoning or cases of suspected arsenic poisoning only a small aliquot of stomach contents, tissue, or substance to be tested be used in this presumptive test, the remainder to be forwarded to a laboratory qualified to perform toxicological work. Specimens of stomach contents, intestinal contents, liver, spleen, heart, brain, vomitus, or urine may be submitted for toxicologic examination. A letter giving the history of the case and postmortem findings, and stating the poison to be tested for should be attached to the container in mailing so that the specimen and information relating to it reach the laboratory at the same time.

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Advances in Chemotherapy

The development of chemotherapy during the first half of the twentieth century has provided one of the most romantic chapters in the achievements of medicine. The search for chemicals and other substances which are specific "killers" of disease agents that infect mankind and his animals and that are not toxic, is an adventure into the unknown. The chemist, biologist, and other specialists, have developed in their respective fields information which has served as building blocks to construct chemotherapeutic agents that have reduced suffering and prolonged life. These awe-inspiring developments have been guided by humble men working among the glassware of the laboratory or among cages housing test animals.

The progress may appear spectacular to the layman but it has occurred step by step on the proof of theories shown by many workers. Advances continue with vigor and confidence, gaining momentum with every stride. Forbidding problems exist as a challenge that will be met with further elevation of common understanding in the employment of potent non-toxic agents having specific affinity against agents of disease.

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Some little-known facts about the extent of America's dog food industry were cited by Harold P. McGrath, general manager, Gaines Division of General Foods Corporation, Kankakee, Ill., in the course of a talk before the GF Luncheon Club in the Biltmore Hotel, New York.

In 1948, said Mr. McGrath, the prepared dog food business, in dollar volume, amounted to about 25% of the total grocery store coffee business; it about equalled the total ready-to-eat breakfast cereal business, was twice the package dessert volume, seven times the cake flour and six times the cake mix volume, and five times the combined baking chocolate and breakfast cocoa volume sold through grocery stores.

PRINCIPLES OF ANIMAL HEALTH

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A correspondent from western Kansas—no veterinarian within a hundred miles—wrote us that some of his pastured cows were affected with cracking and deformed hoofs, and some slight loss of tail hairs. Drought conditions have prevailed in that section of the state for some months. As a result, grazing cattle consume roughages avoided by them in seasons of more abundant rainfall. A few years ago in a trip to that section of the state to investigate an ailment of horses showing symptoms similar to those observed in the cattle, by our correspondent, we made a diagnosis of selenium poisoning. This was later confirmed by a chemical analysis of some plants which had been growing near some shale beds, with a demonstration of selenium content. Our correspondent was advised to supplement the pasture grazing of these cattle with good roughage so that hunger would not drive them to questionable vegetation. Since research on rats indicates that arsenic has an antidotal effect in relation to selenium, we also suggested the use of some Fowler's solution for these cattle. As alternative diagnoses, ergotism and excessive dryness of the hoofs were also mentioned as possible causative factors.

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Morgan, *et al.*, during the June 21-23, 1949 sessions of the second annual Postgraduate Conference for Veterinarians, as reported in the *Veterinary Science News*, University of Wisconsin, Madison, indicated in the handling of four bulls infected with *Trichomonas foetus* that they "cured" these animals by means of five intravenous doses of sodium iodide administered at 48-hour intervals. The chemical was dissolved in sterile distilled water. The dose given was 5 gm. of the iodide for each 100 pounds of body weight. Also, "two treatments were given locally to the penis and prepuce at a 14-day interval."

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It seems reasonably well established that the *Ascaris lumbricoides* of man and swine, though morphologically identical, are biologically dissimilar. At least man has not become infested following the ingestion of the embryonated eggs of the swine ascarid, and swine do not develop ascariasis after they have been given eggs of ascarids of human origin.

There is some agitation again to require the practical, universal vaccination of some 15,000,000 children with BCG vaccine (Bacillus Calmette Guerin) with the objective of attempting to establish a resistance to subsequent infection with the tubercle bacillus. Some of the apparently valid objections raised to this agitation are; (1) that animal experimentation has failed to establish a high degree of resistance in cattle that had been vaccinated with BCG; (2) that the BCG vaccine is derived from a highly pathogenic strain of the bovine tubercle bacillus and as the factors governing the relationships between pathogenics and nonpathogenics are not fully known, the BCG vaccine cannot be regarded as a fixed entity; (3) the evidence now indicates that a natural infection during childhood does not necessarily protect against tuberculosis of the adult and if this natural infection fails to immunize the individual then, what reason is there for assuming that an artificial vaccination will give protection against infections?

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In a letter recently received, the writer asked for information about border Collies. The term was strange to us so we decided to become better informed with the result that it was learned that three strains of Collie dogs are recognized, *i.e.*, the rough-coated, the smooth-coated, and the bearded Collie. The colors of the latter are usually slate and red; the slate being known as the Border variety and red as Highland variety.

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Trichinosis in man sometimes results in thrombotic occlusion of parts of the arterial system. If major blood vessels are involved, gangrene of the affected area may be a sequence. Veterinarians should endlessly preach the danger existing in the consumption of raw, or incompletely cooked or processed pork, it might be trichina infested.

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The Special Committee on Brucellosis of the U. S. Livestock Sanitary Association has presented data indicating that brucellosis-free cattle calve every 11.5 months, infected cattle on an average of every 20 months, and one out of every five cows aborting will become sterile.

Nicotine Arsenate-Copper Sulfate As A Sheep Anthelmintic*

D. F. EVELETH, D.V.M., Ph.D.,** and ALICE I. GOLDSBY, A.B.**

COPPER sulfate and extract of tobacco were two of the first anthelmintics to be used extensively for sheep. At present nicotine or nicotine sulfate has largely replaced the tobacco extracts and powders. The copper-nicotine mixture is less effective than phenothiazine against the helminth parasites but is much more effective against the tapeworm parasites.

The veterinarian or sheepman treating a flock of sheep desires an anthelmintic that is effective against both types of parasites and one that is, at the same time, easy to give to the sheep. Many prefer a single small "pill" to a drench.

Copper sulfate in combination with sodium arsenate was used effectively as the South African "wire worm remedy." Originally the wire worm remedy was given as a powder in two equal doses, 24 hours apart. Later the same ingredients were used in a drench made with an acid solution. This drench is still quite popular.

The standard copper sulfate-nicotine sulfate mixture has been popular as a drench because it is efficacious, inexpensive, and, when properly used, its toxicity is low. Harshfield and Esplin[1] found, in preliminary studies, that this drench decreased the number of liver condemnations due to the presence of fringed tapeworms in the bile ducts. Later studies by Harshfield[2], however, showed no significant difference in liver condemnations between feed lot lambs that had been drenched with copper sulfate-nicotine sulfate and the untreated controls.

McCulloch[3] first advocated the used of lead arsenate for the removal of broad tapeworms from sheep. This chemical is sparingly soluble and relatively large doses can be tolerated by sheep and lambs.

In 1945, the authors[4] described an anthelmintic mixture containing copper sulfate, nicotine sulfate, sodium arsenate and phenothiazine incorporated in an alkaline medium. This alkaline anthelmintic has been used successfully in the treatment of a large number of sheep. The most serious objections to it have been; (a) difficulty in keeping the phenothiazine and soda in suspension, (b) high toxicity in some cases, (c) formation of a heavy precipitate when the alkaline powder was mixed with hard water and, (d) the necessity of a large volume of water to dilute the active ingredients.

It is the purpose of this report to summarize some experiments with copper sulfate and nicotine arsenate as a sheep anthelmintic.

Our previous findings[4, 5] had indicated that arsenates were of a relatively high degree of efficiency for the elimination from the intestine of the broad and fringed tapeworm.

Tablets composed of the following ingredients were made and subjected to the tests described below:

Nicotine arsenate	1.87 gm.
(equiv. to nicotine 1.00, arsenic 0.46)	
Copper sulfate	1.00 gm.
Filler, q.s.	

Five sheep were weighed and given one tablet each and continued on regular feed. After ten days all sheep showed a decrease in weight, the average loss was 2.5 pounds for the period. During the next six days all but one sheep increased in weight with an average gain of 2.3 pounds.

A typical toxicity test is illustrated in table I. The sheep were not fasted and had access to water and feed before and after dosing with the tablets.

Table II shows toxicity tests in which the medication was diluted in water. Each 30 ml. of suspension represented one tablet. The suspension was given by means of either a stomach tube, Whitlock dosing nozzle or short nozzle syringe.

A test of storage of arsenic was made on a group of lambs used in a vitamin A deficiency test. These lambs were maintained on a low carotene ration, on concrete floors. They showed evidence of parasitism and, in some cases, abscesses were found in the lungs. The group averaged about 40 pounds in weight. Each lamb was given one-half tablet containing 0.127 gm. copper, 0.23 gm. arsenic and

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0.50 gm. nicotine. The arsenic dosage was approximately 0.0057 gm. per pound. As the lambs died from vitamin deficiency or were killed for tissue studies, samples of liver were saved for analyses. The data are given in table III.

It can be seen from the results of liver analyses detailed in tables I, II, and III that there is an immediate concentration of arsenic in the liver and that its rate of removal varies considerably with the individual. It would appear that most of the arsenic is eliminated from the liver in about two weeks. Lamb no. 246, table III, however is an exception to this general observation.

One rather complete field trial was made with the nicotine arsenate-copper sulfate tablets. A flock of 450 feeder lambs was selected and four of every five lambs given a tablet containing 1.57 gm. nicotine arsenate and 1.0 gm. copper sulfate. In a few cases of very small lambs, a half tablet was given. A part of the flock was ear-tagged, weighed and segregated for postmortem observations. In the weighed group, 100 treated lambs gained 9.97 pounds each from January 31 to March 1, while 26 untreated lambs gained 9.92 pounds each. The weight difference between the two groups is small. In the dosage used there was little or no permanent stunting of the treated lambs.

The lambs used in this test came from an area known to be heavily infested with fringed tapeworms. None of the livers of the 126 lambs used in the experiment reported here was found to harbor tapeworms.

The owner of the sheep offered the following explanation. He stated that whenever animals were put in his feed lots they immediately passed worms in the feces. He gave as a reason the type of drinking water used. His well water came from a bed of lignite coal and had an odor of creosote. There were stomach worms in the untreated lambs examined at slaughter, while there were none in the treated. No complete counts were made. One hundred lambs taken from the same flock in October and fed at another feed lot were slaughtered in March. The liver condemnation from fringed tapeworms was approximately 20%.

In the field test reported here, 23 of 450 lambs died in the seven days following the dosing with the tablets. All of these lambs had diarrhea and became either very stiff or paralyzed. The average weight of the treated lambs was 78.7 pounds so that the amount of arsenic was 0.0059 gm. per pound, which is approximately one-third the m.l.d. as determined in our toxicity tests.

The individual, as well as the flock susceptibility, to arsenicals, seems to vary widely. We have had reports of serious poisoning following the use of the alkaline anthelmintic mentioned in the foregoing. One sheep man reported 70 deaths within 24 hours after treating 200 sheep. A sample of the drench brought to the laboratory and given to sheep did not produce symptoms of poisoning.

Further laboratory and field tests indicated that under certain conditions 1.87 gm. of nicotine arsenate was too high for general use. Some flocks tolerated the dose without loss, while in other flocks there were heavy losses. The factors responsible for the lowered tolerance of nicotine arsenate in some individuals has not been determined.

Investigations were made using a tablet containing 1 gm. copper sulfate, and 0.93 gm. nicotine arsenate. This tablet contained approximately the same amount of copper and nicotine that would be contained in 100 ml. of the standard mixtures of 1% copper sulfate and 1% of a 40% nicotine sulfate solution.

TABLE I—TOXICITY OF NICOTINE ARSENATE-COPPER SULFATE TABLETS

No.	Wt.	Dose Tablet	Dose (Grams Per Pound) Copper	Arsenic	Nicotine	Liver As P/P/M	Remarks
3949	31	½	.0041	.0074	.0161	.....	No symp.
1693	41	1	.0062	.0112	.0244	.....	No symp.
3942	55	2	.0092	.0167	.0364	28.0	Dead 24 hr.
671	102	4	.0099	.0180	.0392	.....	No symp.
248	124	5	.0102	.0185	.040	27.5	Dead 24 hr.
3903	50	2	.0102	.0184	.040	39.5	Dead 48 hr.
3947	63	3	.012	.0219	.0476	47.5	Dead 48 hr.
3810	84	4	.0121	.0219	.0476	20.1	Dead 24 hr.
3945	59	3	.0129	.0234	.051	29.2	Dead 24 hr.
296	69	4	.0147	.0266	.05796	42.6	Foamed at mouth immed. after dosing, dead 24 hr.

The arsenic content of 0.23 gm. is roughly equivalent to the recommended dose of lead arsenate for tapeworms.

The anthelmintic efficiency of the tablets containing the lowered amounts of nicotine arsenate is summarized in table IV.

The dose for all lambs was one-half tablet. Those drenched were dosed with one-half tablet crushed and dispersed in 60 ml. of distilled water given by means of a Whitlock nozzle. Lamb no. 194 died four days after treatment. When treated this lamb was very weak from a persistent diarrhea. It is interesting to note in this case that although a postmortem examination was made before rigor mortis had developed, all of the Haemonchus were dead and the tapeworms broken into very small segments.

Three small flocks of lambs have been treated using the tablets with the reduced nicotine arsenate content. In no case have there been symptoms of toxicity.

Lambs and ewes suffering from heavy infestations of parasites are often highly susceptible to poisoning from the majority of our anthelmintic substances. In any case, where lambs show evidence of anemia, weakness or diarrhea, they should not be treated with standard doses of vermicides. The plan recommended is to treat with one-half dose of the anthelmintic and to feed a ration high in protein. Some of the parasites are eliminated and the lamb starts to rebuild its blood constituents and regain its strength. After a week or so, a standard dose may be given without causing undue toxic reactions.

TABLE II—TOXICITY OF NICOTINE ARSENATE-COPPER SULFATE DRENCH

No.	Wt.	Dose ml.	Dose (Grams Per Pound) Copper	Arsenic	Nicotine	Liver As P/P/M	Remarks
1	56	30	.0045	.0082	.018	.....	No symp.
2	111	60	.0046	.0083	.018	.....	No symp.
3	48	30	.0053	.0096	.021	5.1	Killed 7 days after dosing
4	46	30	.0055	.0100	.022	.....	Down 1 min. recovered 30 min.
5	91	60	.0056	.0101	.022	.....	No symp.
6	44	30	.0058	.0105	.0227	.....	No symp.
7	44	30	.0058	.0105	.0227	.....	Staggered immed., quick recovery
8	87	60	.0058	.0106	.0229	.....	Staggered in 5 min. quick recovery
9	80	60	.0064	.0115	.0250	.....	Staggered in 4 min. quick recovery
10	69	60	.0074	.0133	.02898	.....	Staggered in 3 min., quick recovery
11	69	60	.0074	.0133	.02898	.....	No symp.
12	58	60	.0088	.0158	.0345	27.8	Convulsions immed. dead 48 hr.
13	57	60	.0089	.0161	.0351	.....	No symp.
14	53	60	.0096	.0174	.0377	.....	Convulsions immed. dead 72 hr.
15	127	150	.0100	.0181	.0394	55.5	Immed. convulsions and death
16	69	90	.0110	.0200	.0435	.....	Very sick, 48 hr. paralysis
17	89	120	.0114	.0208	.0449	.....	Convulsions, dead 48 hr.
18	61	90	.0125	.0226	.0492	19.5	Convulsions, dead, 48 hr.
19	77	120	.0132	.0239	.0519	.....	Immed. convulsions and death

An earlier report from this laboratory[5] presented information indicating that it was uneconomical to attempt to fatten lambs that were stunted by parasitism and malnutrition. Producers of feeder lambs would better serve themselves and the industry if they would raise healthy lambs for sale to lamb feeders. The following outline is suggested as a model for a program to be used in raising lambs suitable for sale either as grass fat weanlings or high grade feeder lambs:

1. Treat all sheep for parasitism in the fall and spring.

2. Feed the ewes a complete ration including minerals, grain, protein, and green hay during the winter.

3. Feed mineral supplements containing trace minerals, cobalt, iodine manganese, iron

and copper, and add one pound of phenothiazine to each 14 pounds of mineral. Feed all the year round.

4. Creep feed lambs all summer. Add phenothiazine to grain at the rate of one pound to 400 pounds.

5. Use a watering trough.

6. Drain or fence sloughs and pot holes.

7. Rotate pastures. If evidence of parasitism develops, treat all sheep and lambs individually before changing pastures.

8. Remove manure from lots and barns several times during the winter.

9. Individually treat and isolate all newly purchased sheep before adding them to the flock.

10. If nodular worms are present, treat all sheep with one ounce of phenothiazine, preferably in late winter or early spring.

11. If signs of parasitism develop, use an anthelmintic effective against both roundworms and tapeworms.

Summary

The toxicity of a nicotine arsenate-copper sulfate mixture has been determined.

The arsenic content of the livers of sheep given various doses of arsenic has been determined.

Anthelmintic value of nicotine arsenate and copper sulfate is reported.

TABLE III—STORAGE OF ARSENIC IN THE LIVERS OF LAMBS.

Lamb Numbers	Days after Dosing	Arsenic in Liver Parts Per Million
3912	not treated	0.0
3927	2	6.75
3938	4	5.0
3921	11	4.75
3936	15	0.0
3910	32	0.0
675	54	Trace
246	67	3.56
3943	113	0.0

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(*Continued on page* 128)

TABLE IV—ANTHELMINTIC EFFICIENCY OF COPPER SULFATE-NICOTINE ARSENATE

No.	Wt. 9-14	Dosing	Days After Dosing	Hae.		Ost.		Nema.		Trich a		Trich c		Cha.		Tape	
				*	**	*	**	*	**	*	**	*	**	*	**	*	**
189	50	D	29	780	0	170	0	90	3734	0	0	7200	2358	0	0	90	0
190	48	D	18	200	0	520	2646	0	0	0	1134	4460	10672	120	0	0	0
193	73	D	25	260	0	720	0	60	2074	0	240	600	3546	0	0	0	0
194	56	D	4	0	dead 575	600	7972	0	7488	0	1880	5600	21408	200	131	0	65 gm.
188	51	½T	29	520	0	1060	0	60	690	0	0	4200	442	0	0	0	0
192	40	½T	25	520	2260	600	2880	0	2980	0	0	15580	0	0	0	1920	0
195	52	½T	27	660	650	600	1314	0	1196	0	0	2520	2497	0	0	0	0
198	49	½T	15	920	270	260	990	0	1384	0	840	6000	2677	120	48	0	0

Hae.—*Haemonchus contortus* (eastern stomach worm), Ost.—*Ostertagia sp.* (western stomach worm).
Nema.—*Nematodirus sp.* (thread necked strongyle, Trich a.—(*Trichostrongylus axei* (small stomach worm).
Trich c—*Trichostrongylus colubriformis* (small intestinal worm), Cha.—*Chabertia ovina* (bowel worm).
Tape—*Moniezia sp.* (tapeworm).
*Ova per gram of feces at time of treatment.
**Parasite count at post mortem.
D—Drench.
T—Tablet.

Serum Level Response of Horses to Procaine Penicillin in Oil With Aluminum Monostearate*†

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THE SUPERIOR performance of procaine penicillin in oil over that of penicillin in oil and wax for maintaining measurable serum levels in domestic animals has been reported previously[1,2]. Further development of procaine penicillin products has resulted in production of procaine penicillin in oil with aluminum monostearate, an adjuvant for delaying absorption. Since there is obviously much advantage for effective blood levels of long duration in veterinary practice, the study reported here was undertaken to determine the performance of procaine penicillin with the aluminum monostearate adjuvant.

TABLE I—PROCAINE PENICILLIN IN OIL WITH ALUMINUM MONOSTEARATE—1,000 UNITS PER POUND

Weight in Pounds	Units in Total Dose	Units per ml. of serum at specified hours following injection						
		1	8	16	24	32	40	48
1140	1,140,000	0.16	0.08	0.00	0.00	0.00	0.00	0.00
1370	1,370,000	0.04	0.00	0.00	0.00	0.00	0.00	0.00
990	990,000	0.16	0.08	0.00	0.00	0.00	0.00	0.00
1125	1,125,000	0.08	0.04	0.00	0.00	0.00	0.00	0.00
1100	1,110,000	0.08	0.04	0.00	0.00	0.00	0.00	0.00
1050	1,050,000	0.04	0.04	0.00	0.00	0.00	0.00	0.00
1140	1,140,000	0.16	0.08	0.00	0.00	0.00	0.00	0.00
570	570,000	0.16	0.08	0.00	0.00	0.00	0.00	0.00

Methods and Material

The horses used in this study were apparently normal Thoroughbred and American Saddle stock. All animals were kept in box stalls with free access to hay and water throughout the test periods. Blood samples for assay were obtained from the jugular vein, allowed to clot at room temperature, the serum removed and frozen at 18 C. until the end of the bleeding periods. Blood samples were obtained at one, eight, 16, 24, 32, 40 and 48 hours following injection of penicillin. The method of assay was the serial dilution procedure using *Streptococcus equi* as previously reported.[3] Doses of penicillin were measured as accurately as possible in glass syringes and injected at one site approximately 1½ inches deep in the musculature of the neck. The preparation used contained 300,000 units/cc. of crystalline procaine penicillin G suspended in sesame oil with 2% w/v aluminum monostearate.

Results

With doses of 1,000 units per pound of body weight, penicillin was present in the serum at one hour following injection in each of eight trials. The concentration varied from 0.04 to 0.16 units/cc. of serum. At the eighth hour following the injection of penicillin, a measurable quantity was present in the serum of seven of eight horses. The concentration was 0.04 units/cc. in three trials and 0.08 units/cc. in four trials. Penicillin was not present in the serum in detectable quantity, 0.02 units/cc. of serum, in any of the eight horses for the sampling intervals from the sixteenth to forty-eighth hours. (Table I).

Using doses of 2,000 units per pound of body weight, a detectable quantity of penicillin persisted in the serum for eight hours in three trials, for 16 hours in two trials, 32 hours in one trial, and 48 hours in two trials. Serum concentrations of penicillin varied from 0.08 to 0.64 units/cc. for the first hour following injection, 0.04 to 0.32 units/cc. for the eighth hour period and from a zero reading to 0.08 units/cc. for sampling periods from the sixteenth to forty-eighth hour. (Table II).

*The investigation reported in this paper is in connection with a project of the Kentucky Agricultural Experiment Station and is published by permission of the Director.

†The penicillin used in this study was supplied for experimental use by Schenley Laboratories Inc., New York City, New York.

**Department of Animal Pathology, Kentucky Agricultural Experiment Station, Lexington.

Discussion

The comparative performance in horses of penicillin in oil and wax and procaine penicillin in oil was reported in a previous study.[1] Penicillin in oil and wax resulted in serum level responses varying from three to 12 hours with doses of 1,000 units/pound, from six to nine hours with doses of 2,000 units/pound, except for one trial persisting for 24 hours, and from six to 14 hours with doses of 4,000 units/pound. For procaine penicillin in oil, the serum level responses varied from nine to 21 hours with doses of 1,000 units/pound, from 18 to 24 hours with doses of 2,000 units/pound and was 24 hours in all trials with doses of 4,000 units per pound. For the 4,000 units/pound doses the assay periods were terminated at 24 hours, with serum levels of sufficient concentration to indicate that measurable quantities would have been present for 30 hours or longer in most of the trials.

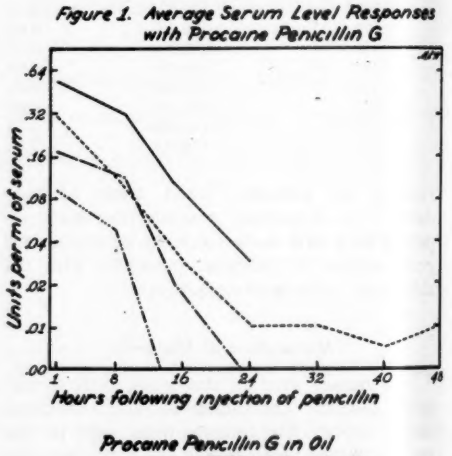
For procaine penicillin in oil, the duration of the serum level responses varied from nine to 21 hours with an average of 14 hours for doses of 1,000 units per pound, while that for procaine penicillin in oil with aluminum monostearate was eight hours in seven of eight dosage trials. The serum concentrations for procaine penicillin in oil were higher than those obtained with the aluminum monostearate adjuvant. With doses of 2,000 units/pound, the duration of the serum level response with procaine penicillin in oil varied from 18 to 24 hours with an average of 20 hours. For procaine penicillin with aluminum monostearate the duration of the response varied from eight to 48 hours with an average of 23 hours. Penicillin concentrations in the serum for the first 24 hours were approximately three times higher for the procaine penicillin in oil. Averages for the serum level responses are shown in figure 1. It should be noted that the averages for the 24 to 48 hour period with the 2,000 units/pound dose of procaine penicillin with aluminum monostearate resulted from one trial with a duration of 32 hours and two trials persisting for 48 hours.

Obviously, if a measurable serum level is to be maintained, any vehicle for intramuscular injection must release the penicillin at a rate exceeding renal excretion. Comparison of the serum level responses of horses to the two penicillin preparations indicates that the addition of the aluminum monostearate adjuvant reduced the rate of absorption from the intramuscular depot to such an extent that measurable serum levels were not obtained. The results obtained in this study differ from the claims for serum level responses of long duration in human patients, in which procaine penicillin with aluminum monostearate appears to have considerable advantage in maintaining measurable serum levels. In our studies on the serum level responses of sheep, cattle and

TABLE II—Procaine Penicillin in Oil With Aluminum Monostearate—2,000 Units Per Pound

Weight in Pounds	Units in Total Dose	Units per ml. of serum at specified hours following injection						
		1	8	16	24	32	40	48
1140	2,280,000	0.64	0.32	0.04	0.00	0.00	0.00	0.00
1370	2,240,000	0.32	0.16	0.08	0.02	0.04	0.00	0.00
990	1,980,000	0.32	0.08	0.00	0.00	0.00	0.00	0.00
1125	2,250,000	0.08	0.08	0.02	0.04	0.04	0.04	0.08
1100	2,220,000	0.32	0.08	0.00	0.00	0.00	0.00	0.00
1050	2,100,000	0.08	0.16	0.04	0.00	0.00	0.00	0.00
1140	2,280,000	0.32	0.04	0.00	0.00	0.00	0.00	0.00
570	1,140,000	0.32	0.08	0.04	0.04	0.00	0.02	0.02

Figure 1. Average Serum Level Responses with Procaine Penicillin G



horses, it has been found that larger doses of aqueous penicillin are required for maintaining measurable serum levels for a given period than has been reported for man.

Severe swelling and soreness resulted from injection of the aluminum monostearate preparation in a few animals. It appears unlikely that the reaction was due to sensitization to penicillin, as veterinarians in the Central Kentucky area have observed numerous reactions in horses which had not received penicillin previously, and similar reactions have not been seen with procaine penicillin in oil.

Summary

The serum level response of horses to procaine penicillin in oil with aluminum monostearate was determined.

Serum level responses following injection of procaine penicillin with aluminum monostearate were more erratic and lower in concentration than those obtained without the adjuvant. Addition of aluminum monostearate apparently reduces the absorption rate to such extent that measurable serum concentrations are not obtained.

Undesirable inflammatory reactions resulted from procaine penicillin with aluminum monostearate in a number of horses.

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Of 20 head of anaplasmosis-infected cattle, treated with paludrine hydrochloride (DuPont), Farley, *et al.*, report 85% recoveries. Quinoline diphosphate (DuPont), given intravenously to 49 field cases in most of which the r.b.c. had dropped below 3,000,000 per cubic millimeter when treated, and to 46 laboratory cases, shortened the cycle of infection and the treatment proved an aid to recovery. Preliminary trials using aralen diphosphate (Winthrop-Stearns) gave 100% recovery in nine animals treated.—*Jour. Am. Vet. Med. Assn.*, 116:124 (Feb.), 1950.

Col. Fred C. Waters, V.C. Ret., Dies

Col. Fred C. Waters, V.C., retired, 62, died January 6, 1950, at Letterman General Hospital, Presidio of San Francisco. Interment was at the Presidio of San Bruno, Calif.

Colonel Waters was graduated from the College of Veterinary Medicine, Ohio State University in 1912, commissioned a second lieutenant in the O.R.C. in June and ordered to active duty in the National Army in July 1917. He was promoted through the grades to lieutenant colonel in 1937. During World War II, he served in the temporary grade of colonel. He was retired for physical incapacity soon after the close of hostilities.

During most of the late war Colonel Waters was commandant of the Army School of Meat and Milk Hygiene at the Chicago Quartermaster Depot.

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Breed Characteristics Versus Utility Value of Dairy Cows

Breeders of purebred dairy cattle can better maintain a position of leadership by improving the utility value of their animals than by continuous efforts in promoting those breed characteristics that have only questionable relation to milk-producing ability. Dr. O. E. Reed, Chief of the Bureau of Dairy Industry, USDA, has pointed out also that less than 5% of the 24 million milking cows in the United States are registered and that 95% are largely grades of various dairy breeds.

In outlining measures for improving purebred dairy cattle, Doctor Reed emphasized the need for including record of performance as a requirement for registration. Dairy associations would thus take a forward step toward improving their herds as reliable sources of proved utility animals, combining performance at the milk pail with conformation and ancestry requirements. By these means we might very well boost the percentage of purebreds in ordinary farm herds, as well as the average milk production record.

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Henderson and Brooksby, in *The Journal of Hygiene*, state that usually the rigor mortis acidity of muscle tissue destroys any contained foot-and-mouth disease virus. All tissues of the body do not have such a high degree of acidity as muscle, and therefore in these the virus is still alive after an elapse of at least four months of freezing with subsequent thawing.

Mastitis From A Veterinary Practitioner's Viewpoint

PAUL GAMBREL, D.V.M., Winnebago, Illinois

VETERINARIANS, especially those who work and live in concentrated dairy areas, are all too familiar with clinical mastitis. Its seriousness in causing millions of dollars' loss in dairy cattle and milk production every year is an everyday problem.

Fortunately, most dairymen can spot the disease, even in the early stages. Fortunately, too, there are ways to identify it and drugs with which to treat it. But a "cure," a way to stop its ravages permanently, remains as big a problem as ever for veterinary science and the dairyman.

The writer is becoming more convinced every day that the solution to mastitis problems in our herds must be a joint responsibility, shared by veterinarians and dairymen. Veterinarians can do their share in a battle of control, maybe more, if called early, but it is the man who milks those cows in whose hands rests the success or failure of all treatment. What precautions the milker takes against infections, how he milks, and with what kind of milking machine, spell success or failure in herd control of the mastitis problem.

The idea behind the foregoing statement is not exactly new, but from personal experience in the barns of local dairymen, it is well worth repeating. In fact, many fine cows have been lost and the writer has stood helplessly by and watched his treatment fail for no reason that he could control.

Mastitis is no problem on some farms. On others, it is a constant one. Why?

Growing up in the home of a practicing veterinarian, spending five years at Michigan State College studying mastitis under Doctor Bryan, and spending the last seven years in practice on and around farms, most of them with dairy herds, has prompted that question many times.

At first, the author believed the answer was bacteria, just as most veterinary specialists believed. Correct and early identification of the types of mastitis present in a herd, severe precautions against the spread of the disease, and medical treatment to kill the infection in those cows which showed symptoms were the only steps taken.

But that is not a wholly satisfactory answer. Even with the recent addition of penicillin and other antibiotics to our weapons with which to fight mastitis, relief of symptoms is not always effected.

Going from case to case on different farms, some mastitis, some other things, it became apparent that flare-ups of mammary inflammation varied in proportion to different types and kinds of milking machines in use. However, it was not a proportion that could be put down as a fact.

One of the first clients, a young man with a degree in dairy husbandry from the same college the author attended, started dairying just before I started practicing. At first he had quite a few flare-ups in his dairy herd which we treated according to common practice. During the treatments, he put in and started using a suspended type of milking machine. A short time later mastitis cleared up and has given little trouble since.

That was an early clue, but not realized at that time. It was thought the infection had been licked with drugs. It seems now that the dairyman solved it by a change in milking methods.

Another of the many examples was a neighbor who decided to quit raising hogs and bought $5,000 worth of cows. Some of them were really good producers, too. It was not long before the writer was called to see what could be done for some mastitis. It was noticed that a claw-type milker was being used. In less than a year, the best cows in the herd had to be shipped for slaughter and the farmer sold out, cows and machine, the whole works.

The man who bought the cows continued using the same machine and mastitis finally sent the rest of that herd to the butcher.

On one case where attention was given a lacerated teat, it was noticed that the dairyman was not taking even simple precautions. On inquiry, he replied that there did not seem to be any udder trouble, except in cows they occasionally purchased, and that usually the condition cleared up without treatment. It was observed that he used a suspended type milker.

The answer was coming, especially when a small dairyman who was always in trouble with the Health Department requested a con-

sultation. He had plenty of mastitis, and a claw-type milker. A change in milking machines was suggested. A year later he had switched and was producing good milk again. On a check of the herd later, no symptoms of mastitis were observed.

During the war when milking machines were hard to get, especially the suspended type, switching the inflations on the milkers was tried. It did help a little in some cases.

It was becoming plainer with every farm visited that the suspended type machine did not injure the udder as most claw-type machines seemed to do. Milk samples were taken for bacteriological study, thousands of them, and infection was demonstrated, but not clinical mastitis in those herds where proper milking was practiced. Dairymen using the suspended type of machines and those who ran just a few single unit claw-type machines holding the cups down, were not suffering losses due to diseased udders.

Some other veterinarians and the writer are becoming more convinced that the predisposing factor is trauma, or injury to the upper part of the teat lining, and in my opinion, 90% of the trouble is caused by improper use of a milking machine.

There just are not enough men who will run a claw-type machine properly to keep it from irritating some teats on some cows. Just leaving such a machine on a cow for a certain length of time is not proper milking, and in many cases is the real causative factor of acute mastitis.

The suspended type machine, on the other hand, uses the weight of pail and milk to pull downward and forward. Generally speaking, the teat cups do not get high enough up on the teat to cause serious injury. As a result, the average operator of a suspended type milker does a better milking job; at least, he does not have the udder problems of those men using the claw-type machine.

The fact that until recently there was only one manufacturer of a suspended type milker, raised an ethical question when it came to prescribing a change of machines to a dairyman. However, as it became more apparent that the method of milking had so much to do with our efforts, coupled with the fact that this suspended milker seemed to help a great deal, the time came when resort to it appeared to be the only answer.

The occasion was a purebred farm with a herd of 60 to 80 animals. An old establishment, it was managed by an experienced cow man who had made records as a champion milker. Here was a farm and herd where mastitis could and was costing money. To let it get beyond control was to stand a considerable loss. Though the milking herd was small, it consisted of some high producing animals. When called on the case, there were flare-ups in a sizable portion of the herd and penicillin bougies were being used to hold the bacterial count down.

Samples were taken on 28 head; five definitely were infected, with about 65% showing the presence of white blood cells in the milk, the latter considered potentially dangerous. There were only about a half-dozen cows that were all right.

A check was first made for cleanliness; going back over the records for three years it was noted that the bacteria counts were within the stated requirements, except in summertime, but were never as high as on this occasion.

Treatment was started with penicillin, rigid fly control practiced, cows kept out of wooded pasture in an effort to prevent accidental udder injury. Teat-cup dipping operation between cows was checked carefully and the representative of the milker they were using was called in. It was suggested that the man who was stripping after the machine be changed just to be sure no injury was resulting from the hand stripping.

A week later the five infected cases had been reduced to three; these had failed to make any improvement. The rest of the herd was as bad as ever. Medicinal treatment continued and if it had not been for the penicillin treatment several of the cows would have been condemned.

Two months passed without further improvement; there was still mastitis present in most of the herd in spite of all treatment, all the antibiotics used and the precautions taken. The owner then put the problem up to the herdsman and me. Another veterinarian was called in for consultation. It was agreed that the real factor was udder injury received in milking and it was decided to test the theory with the help of the herdsman.

The herd was divided into two groups, carefully selecting them so that each group had an even share of the infected cows. Milking was continued in one group as before and treatment continued. The other was milked with one suspended type milker unit operated by one of the regular milking crew. Otherwise, this group was fed, cared for and treated in the same manner as the other group.

This practical comparative trial continued

for over a month with careful records kept for the owner.

From the very first there was a marked difference in production, milking and stripping from cows milked by the suspended milking machine. This operator was finishing his group in 20 minutes less time than the other two operators with the two claw-type units. One cow that had been giving up to a gallon of strippings was milking out entirely with the suspended milking unit. The flare-ups continued in the claw-type machine group. Aside from two cases observed right after the machine was started, flare-ups stopped completely in the group milked by use of the suspended type machine.

Here was a record performance that, placed in the owner's hands, could not be ignored. The entire herd was then milked with the suspended machine with the result that today fewer bougies are used and the bacteria counts are down to normal.

When one observes a thing like that happen, one cannot help telling about it. If proper milking can work such wonders against mastitis (and the writer is convinced it can) be it by hand or by any one type of milking machine, it may prove to be valuable information for others.

Proper, healthy, natural milking is up to the dairyman and the milking machine he uses. Veterinarians can do much, but the burden of disease control is up to the man who does the milking, the milking machine he uses, and the manner in which he employs his machine.

Production Champion

Pictured below is Ringold Lady Dora, Hampshire sow, owned by the Meadowlakes Farms, Inc., Sullivan, Ind., and her ninth production registry star litter, which weighed 369 pounds at the 56-day weaning date. This sow has made a remarkable production record. The first litter to qualify under the production registry rules was farrowed in the fall of 1944. Since then she has produced and raised spring and fall litters without interruption. A total of 105 pigs, 9.5 pigs per litter for 11 litters, were raised of 129 farrowed. The sixth qualifying litter, born in February 1948, consisting of seven boars and three gilts, was sold for a total of $4,365. Owners attribute much of this successful production record to good management and feeding practices.

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When calves are fed in such a way as to encourage early rumen development, large amounts of good quality hay and a simple grain mixture, consisting largely of home grown grains, can be utilized to produce healthy calves at less cost.

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Cud inoculations from older cattle have proved valuable in developing early rumen function in young calves.

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That baby chicks may be carried safely by air as high as 20,000 feet has been demonstrated by the U. S. Department of Agriculture.

—Photo courtesy Kraft Foods Co., Chicago

Omentectomy Of Cattle For Studying Insecticide Residue In The Body

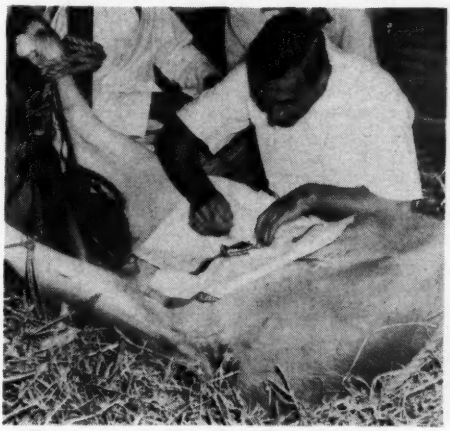
R. D. RADELEFF, D.V.M.,* Kerrville, Texas

THE study of insecticide residues in foods following application of the various materials for the control of pests is of major importance. The newer insecticides, particularly those of the chlorinated hydrocarbon series, have been shown to be absorbed and stored by various animals. Storage has been demonstrated for all known formulations of some of these materials when applied to livestock as sprays or dips. Following definite establishment of the fact that storage did occur, many problems arose. First, what proportion of the applied quantity is absorbed and stored; second, how long does the stored residue persist; and third, what relationship exists between storage quantity and animal condition. The demonstration of tissue pathology in laboratory animals following low level intake of certain of the new insecticides in the diet made answers to these questions imperative, especially in view of the possibility that man could react similarly to even lower levels.

In the past, a major limitation of this type of study has been the need for the destruction of the test animal in order to obtain tissue for chemical analysis. This destruction precluded more than one study per test animal. With the larger domestic animals, such as cattle, this procedure entails very large expenditures in proportion to the data obtained. To conserve animals and at the same time develop accurate data, a method of biopsy appeared to be the best answer. The use of the biopsy is, of course, time-honored for many purposes.

The chlorinated hydrocarbon insecticides, being basically oil-soluble materials, tend to collect in greatest amounts in the fat of the body, thus making the fat depots the ideal source of study material. For experiments planned at the Kerrville, Tex., laboratory of the Bureau of Entomology and Plant Quarantine, a method which would provide a minimum of six samples in a period of six months and an indefinite number after that time from a single animal was needed. In addition, the method was to permit rapid healing, and not cause significant losses of weight or impair the general health, condition or appearance of the experimental animal. Beyond this, the method was not to introduce errors in the analytical procedure.

The above conditions were met, thereby establishing a technic and procedure adaptable to this type of research on cattle and other animals. For this reason and for the academic interest of the records of this series of surgical procedures, this paper is presented. The discussion concerns cattle only, although the procedure has been adapted for other species.



The author demonstrating technic of omentectomy in a calf.

General Procedures

In essence, the technic is based upon a laparotomy which provides access to the peritoneal cavity for omentectomy. Basically it does not differ from a laparotomy performed for other purposes. The choice of site, anesthesia and procurement of sample are specific.

Since the chlorinated hydrocarbon insecticides, except DDT and TDE, must be analytically determined upon the basis of excess organic chlorides present in tissues, the choice of anesthetic is of prime importance. The use of chloral hydrate or chloroform, the standards for bovine anesthesia, is impossible in this work except with DDT and TDE, because their presence could obscure the analyses.

*United States Department of Agriculture, Agriculture Research Administration, Bureau of Animal Industry.

If cost is no object and only a few animals are to be handled, general anesthesia with barbiturate derivatives, as well as ether, might be considered. Both ether and the barbiturates provide so many ordinary disadvantages that they were eliminated as candidate materials in this work. For work with DDT and TDE, chloral hydrate or chloroform could be used if desired.

We have standardized on the use of a 2% solution of procaine hydrochloride in distilled water as the anesthetic of choice. By the use of procaine we gain several distinct advantages. First, while there is chlorine in this chemical, it is eliminated entirely in the first step of analysis. The anesthesia produced is uniform and self-sustaining, requiring no attention after the initial administration. Second, there is no postoperative wait for the return of consciousness, thus allowing the surgeon to give immediately full attention to the next case. Third, there is less likelihood of systemic disturbances following restraint.

Operative Procedure

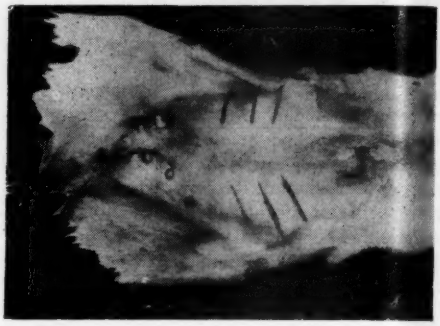
Preoperative preparation consists wholly of removing the patients from feed but not water for a period of 20 hours preceding surgery.

For restraint the animal is cast by the double half-hitch method on a 12-inch thick matting of long-leaf hay. The animal is turned to a position of semi-dorsal recumbency, the half of the abdomen to be operated upon being slightly uppermost. Each leg is secured individually with provision for quick release. One man is detailed to secure the head. Control of the head is important, since regurgitation of food followed by inhalation will occur if the head is not lower than the body and the neck free of twisting. The first fatality occurring in this series of operations was the first animal operated upon, death being due to such inhalation of food.

Choice of the site for incision should be made carefully when many future operations are to be performed. Both halves of the abdomen may be used. In our work we begin with the left midgastric region, moving posteriorly with each subsequent operation up to three, then shifting to the right abdomen.

In preparing for surgery, an area approximately 12 inches square is closely clipped and the clippings carefully removed. The clipped area is then thoroughly scrubbed with sterile water and drained. This washing is followed by saturating the area with an aqueous solution of sodium ethyl mercuri-thiosalicylate, 1:1,000. An excess of this solution is allowed to remain on the area until after administration of the anesthetic.

The site for the incision is selected and an imaginary line designated, or, if preferred, marked with skin pencil. The line should be 2.5 inches in length. It should begin laterally and proceed posteromesially. It should constitute the second of four parts of an imaginary line beginning at the fold of the flank and terminating at the mid-line. The first of a series of incisions should be at the posterior margin of the midgastric region. Later operations are performed at intervals of one or two inches, proceeding posteriorly. The isomeric regions



Sites for incisions through abdominal wall in omentectomy.

and relations are used for the animal's right side.

The injection of procaine should follow a pattern at least 1.5 inches away from the proposed line of incision at any point. Dermal and subcutaneous infiltration are accomplished first, followed by deep infiltration of the muscles. Approximately 50 cc. of a 2% solution of procaine hydrochloride suffice to produce desired anesthesia in most cases. With administration complete, the area is washed again with water and rubbed dry with a cotton pad. While anesthesia develops, the surgeon scrubs his hands.

The area is then draped with sterile towels secured by skin clamps, leaving a one by three inch surgical field. The incision is made through the skin and subcutaneous tissue at one stroke along the previously designated line. The abdominal muscles are split by a combination of incision of the fascia and blunt dissection of the fibers, following a line at an angle to the skin wound. Excessively bleeding points are cared for with hemostats. The peritoneum is then seized with a White's tonsil forceps, drawn up and incised with scissors. A second White's forceps is introduced through

the peritoneal opening to seize the omentum. The omentum is drawn up and out, then clamped from opposite sides with two Doyan's intestinal forceps. The desired portion of the omentum is then resected with scissors. Any large vessels cut in this excision must be ligated.

The resultant stump of omentum is dusted lightly with sterile sulfanilamide (approximately 0.5 gm.) and sutured with silk, then returned to the abdominal cavity. A single purse-string suture may be used to close the peritoneum. The abdominal wound is dusted lightly with sterile sulfanilamide. A continuous suture of silk is used to close the abdominal wall. The skin is closed with interrupted tension sutures of ⅛ inch umbilical tape spaced ¾ of an inch apart. Interrupted sutures of silk provide approximation, alternating with the tension sutures.

Fifteen hundred units of tetanus antitoxin are then administered subcutaneously, followed by 300,000 units of penicillin in oil (96 hour type) intramuscularly. The animal is released to resume immediately full feed and freedom.

TABLE 1—SUMMARY OF WEIGHT GAINS OF STEERS OPERATED UPON VARIOUS NUMBERS OF TIMES AND KEPT ON LOW FEED-LOT RATIONS 200 DAYS.

Animal No.	No. Operations	Net Gain	Group Average
13	7	235	
19	6	315	281.6
20	7	295	
14	6	—*	
16	6	315	300.0
18	6	285	
21	6	280	
22	6	340	305.0
23	6	295	
9	3	—*	
10	3	310	317.5
11	3	325	
25	4	330	
28	4	320	325.0
31	3	350	
33	3	340	345.0
26	2	325	
30	2	**	
34	2	340	336.6
35	2	**	
36	2	345	
32	1	340	
5	5	380	
6	5	315	
12	5	310	
7	4	355	325.8
24	4	295	
29	5	300	
2	1	350	
3	6	290	
4	6	340	338.3
8	1	360	
15	1	330	
27	5	360	

—*Weight not recorded due to illness.
**Slaughtered prior to final weighing.

Discussion

The omentectomy above described has been performed 500 times on cattle. Of this number, 143 such omentectomies were performed on 36 animals. Two fatalities occurred in the series, one due to inhalation pneumonia, one to strangulation of an intestinal hernia at the operative site. Three instances of mild diffuse peritonitis occurred. One severe internal hemorrhage resulted in near death for one animal. The effect of repeated surgery can be seen in the records of table 1, which covers 34 animals operated upon 138 times.

Resection of omentum.

Table 1 shows descending gains with ascending surgical frequency. The lowest gains were made by the group composed of steers 13, 19, and 20. This group was the most frequently operated upon and included one near death and one case of peritonitis. The two animals so affected accounted for 100 pounds of the weight lost due to surgery.

Between the animals operated upon a single time and those operated upon five times, there was a difference in average gain of only 27.5 pounds per animal.

Following the 142 operations performed, 21 instances of weight loss were recorded. Of these, 12 occurred at a time when animals not operated upon also lost weight. It is believed that only nine instances of weight loss can be

attributed to surgery. These nine instances averaged 40.5 pounds each. The 12 other losses averaged 13.7 pounds, while the herd averaged 7.79 pounds per animal in the same period. Perhaps the 5.9 pounds difference could be called surgical loss; if so, it is insignificant. Throughout the experiment a total of 530 pounds was lost, an average of 3.7 pounds per operation.

Perhaps the most significant over-all observation as to the general effect of repeated surgery is the fact that the 31 steers sold on the commercial market after final weighing brought top prices for the day in the Houston, Tex., stockyards. This was one month after 20 of these steers had been operated upon.

Summary

1. A description of a technic developed for the study of insecticide residues in cattle is given.

2. Of 500 such operations performed, two terminated fatally, one due to surgery, one due to aspiration pneumonia.

3. Repeated performance of such surgery does not materially interfere with weight gains nor general health.

4. Neither method nor material interferes with chemical accuracy.

Veterinary Public Health Section Created within the World Health Organization

In order to promote national programs in the several veterinary aspects of public health and to coordinate the international phases of such programs, the Pan-American Sanitary Bureau (PASB) has created its Veterinary Public Health Section.

The PASB is the regional office of the World Health Organization (WHO), and is the central coordinating sanitary agency as well as the general collection and distribution unit for information on public health for the American republics. Formation of the new veterinary division constitutes recognition of the importance of veterinary medicine in modern public health activities.

Dr. Benjamin D. Blood has been designated as chief of the new section. Efforts, in the beginning of the work, will be concerned mainly with a coordinated international fight against three of the animal diseases which endanger human health; rabies, brucellosis and hydatid disease.

Army Standard Inspection Guides

The preparation of the first group in a series of Standard Inspection Guides by the Army Veterinary Corps in cooperation with the Quartermaster Corps, to assure the purchase of only the best meat food and dairy products has been announced by Brigadier General J. A. McCallam, chief of the Veterinary Division of the Army Surgeon General's Office.

While Veterinary Corps standards always have been high, inspection of foods of animal origin, which constitutes the major part of the work of the Corps, has been based in the past on the experience and judgment of the individual officer conducting the investigation. Through the use of the standard guides, it is expected that the inspection of each type of food will achieve greater uniformity of quality and palatability. The guides will also provide a standard procedure to be followed by all inspectors, regardless of location, so that inspections will be the same in all parts of the United States. Since producers and processors who supply food to the armed services also sell to civilian distributors, the work of the Veterinary Corps in this respect will be beneficial also to everyone who eats food of animal origin.

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The ordinary holding or vat method of milk pasteurization (143 F. for 30 minutes) does not destroy the Q fever Rickettsia. Tests have shown that pasteurization at 160 F. for 15 seconds is effective.

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(*Continued from page* 118)

ment of Ovine Taeniasis with Lead Arsenate. *Jour. Am. Vet. Med. Assn.*, 99:496, 1941.

4. Eveleth, D. F., and Goldsby, A. I., The Gastrointestinal Parasites of Sheep in North Dakota. *Vet. Med.*, 40:90 (Mar.), 1945.

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ACKNOWLEDGMENT

The authors wish to express their thanks to the Fort Dodge Laboratories, Inc., Fort Dodge, Iowa, for preparing the tablets used and for financial assistance in conducting these experiments.

They also wish to thank Mr. Kenneth D. Ford, Associate Animal Husbandman, North Dakota Agricultural Experiment Station, Dickinson, for his assistance in conducting the field trials.

Thanks are also due the late Mr. Alec Dinsdale, Dickinson, N. D., who furnished the experimental lambs and facilities for conducting one of the trials.

The authors also wish to thank Mr. D. W. Bolin, Associate Nutritionist, North Dakota Agricultural Experimental Station, for the arsenic analyses reported here.

EDITORIAL COMMENTS

Self-Protection from Radiation Hazards of Fluoroscopy*

Veterinary practitioners who employ *x*-ray apparatus in their practice, and the number is increasing yearly, have frequently referred to the dangers of radiation during fluoroscopy. Emphasis on the necessity of protection for operators is stressed in present day training of roentgenologists.

Effects of radiation are accumulative and resulting skin lesions progress to atrophy and ulceration that show little tendency to heal. In addition to cutaneous effects frequently observed, constitutional effects, such as leukemia, are reported. The former safe dose of 1/10 r. per day for a six-day week has now been reduced to 3/10 r. (300 milliroentgen units) per week as the limit of safe dose. When it is observed that during two hours of work in one day of fluoroscopic examination, an operator may be exposed to 350 milliroentgen units, the danger in regular use of this apparatus is established.

Experimental work was cited by Doctor Schneider to prove the danger of scattered radiation or from rays scattered by a reflecting collision from their original path which may be minimized by the employment of well designed *x*-ray units and carefully planned operative technic. Initially, a ray-proof tube does not exist, some radiation will escape to fog film at distances from the tube which are within those necessary for fluoroscopic work. Tubes made ray-proof would be impractical and unwieldy. Furthermore, the lead apron and gloves always recommended give protection only from scattered radiation and not from direct beams.

Dark room adaptation should be accomplished with due care, allowing 20 minutes under red goggles for preparation for examination. Kilovoltage and amperage employed should be low. A small beam, not over 10 cm. x 10 cm., and less if practical, placed well within the margin of the screen, is advised. Palpation of an animal patient under the screen is one of the most dangerous practices and should be avoided.

Finally, fluoroscopic screens should be integrated to travel with the tube and every possible device to protect the operator should be included with equipment.

Fluoroscopy is a valuable adjunct in diagnosis and the recognition of the hazards in its use will prompt precautionary measures and thus encourage continued safe use of the aid.

*Notes from an address by Dr. Martin Schneider, Professor of Radiology, University of Texas, Medical Branch, Galveston, presented at the 38th annual meeting of the State Veterinary Medical Association of Texas, Galveston, Jan. 23-24, 1950.

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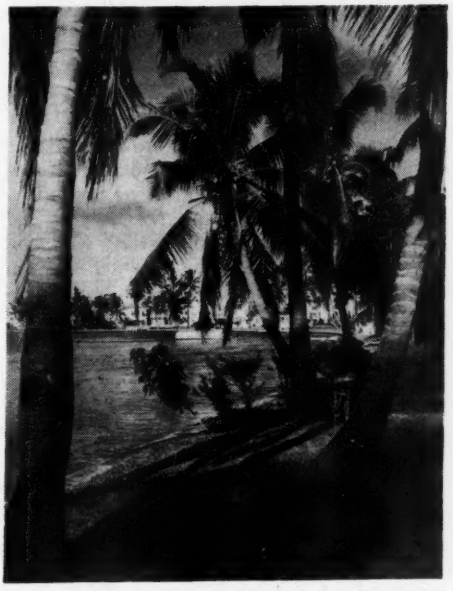
A.V.M.A. Convention Miami Beach—August 21-24, 1950



The palm-fringed banks of the Miami Beach inland waterways provide picturesque settings such as this for the palatial hotels and residences which dot the bordering land area and impress the visitor. Plan to visit Miami Beach to attend the 87th annual meeting of the A.V.M.A., and make a vacation of the trip.

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Aureomycin and Chloromycetin for Human Brucellosis

Acute human brucellosis responds promptly to treatment with either aureomycin hydrochloride or with chloramphenical (chloromycetin). Results with the use of these antibiotics in the treatment of chronic brucellosis are less spectacular but were reported by Ralston and Payne (*Jour. Am. Med. Assn.*, 142:161, [Jan. 21], 1950) to give partial to complete relief of symptoms in 87.5% of a group of 40 patients treated.

Rabies, The Physician's Dilemma*

Whenever a rabies outbreak occurs among dogs in a given locality, every physician in general practice in such locality sooner or later is confronted with the problem of the management of real or imaginary human exposure. Responsibilities face the physician, who must either follow the comparatively simple expedient of advising the Pasteur treatment, or of advising against such immunization and facing the problem of undue apprehension of the patient. The latter is a psychologic problem of considerable moment when it is considered that so much misinformation has been given wide distribution in the public press.

Superstitions and fears among exposed persons, magnified by bad advice of well-meaning friends and neighbors, often produce a state of mental panic. The undue apprehension is stated by Denison to be as common a symptom among the many recently exposed persons as it is among the very few who develop clinical rabies. The situation, wherein a patient refuses medical advice and insists upon vaccine treatment is not uncommon and in such cases the physician is influenced in his judgment regarding the actual need or advisability of treatment.

During the past 25 years the laboratories of the Georgia Department of Public Health have furnished antirabic treatment for more than 50,000 persons, of which number seven developed treatment paralysis, four of these terminated fatally, and only two of this group were treated because they actually had been bitten by rabid dogs.

Of 32 post-treatment rabies fatalities occurring among the 50,000 treated persons, 19, or 60%, were bitten more or less severely on the face; 11, or 34%, were treated following bites on the hands and arms; one, or 3%, following bites on the lower extremities; and one, or 3%, following bites on the body.

In the early years of his experience, Doctor Sellers states that his resistance to the pressure of undue apprehension was low but that his experience and observations prompt his practice of the thesis that rabies is transmissible to man only by direct inoculation of the infected saliva into the flesh deep enough to come into contact with nerve tissue. Most, if not all, situations of human exposure can be safely disposed of to the best interests of all concerned if the medical adviser will consider the following factors and apply them in determining course of procedure:

The Offending Animal: (1) The animal is clinically rabid, (2) the brain shows typical Negri bodies, (3) the animal disappears after biting, and (4) any animal that bites without provocation and is immediately killed regardless of laboratory findings.

Vaccine Treatment is Indicated: (1) When there are visible wounds, (2) when wounds are inflicted through clothing which was torn, (3) when there is reason to suspect that wet saliva came into direct contact with fresh open abrasions, and (4) when person exposed is a small child who is too young to give reliable testimony.

Antirabic Vaccination is Contraindicated in Man: (1) When exposure is limited to contact of saliva with unbroken skin anywhere on the body, (2) when saliva may come in contact with pre-existent wounds covered with an unbroken scab, (3) if teeth wounds are made through clothing which is not torn, and (4) if exposure is limited to handling or petting an animal with which a rabid animal has been fighting, handling object contaminated with infective saliva, drinking milk of rabid cows or goats, if bites or scratches were inflicted not less than seven days prior to development of disease symptoms, or if the biting animal remained normal for as long as one week after biting.

"Rabiphobia," not hydrophobia, constitutes the major and most troublesome problem to the practicing physician and health officer.

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An interesting and informative bulletin entitled Care of the Dog Used in Medical Research, has been issued by the Surgery Study Section of the National Institutes of Health. Veterinarians who assisted in its preparation were Drs. L. D. Frederick (deceased), Wayne D. Riser, and C. T. Schlotthauer. It may be obtained from the Superintendent of Documents, Washington, D. C. The price is five cents.

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Since the Bureau of Animal Industry was created 25 years ago, the country's milk production has risen 29% although the number of cows has increased only 7%. This is attributed to improved breeding, feeding, and management methods which government veterinarians have assisted in developing.—*S.N.L.*

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Henry Clay imported the first purebred Herefords to the United States in 1817.

*Sellers, T. F., *Amer. Jour. of Trop. Med.*, 28:453 (May), 1948.

Symposium on Coccidiosis

Of interest to practitioners and investigators is a volume just published by the New York Academy of Science, entitled Coccidiosis*. It is a compendium of 25 papers presented at a Conference on Coccidiosis, held by the Academy's Section of Biology, March 4-5, 1949. In addition to the formal reports, the volume contains an appropriate dedication to Professor E. E. Tyzzer, together with an excellent photoprint picture; an explanatory foreword by Dr. Sterling Brackett, consulting editor of the publication and chairman of the Organizing Committee of the Conference; a short page of comments by the honorary chairman of the Conference, Doctor Tyzzer; a round-table discussion of special problems moderated by Dr. P. P. Levine and participated in by Drs. C. W. Barber, J. P. Delaplane, L. C. Grumbles, P. A. Hawkins, E. H. Peterson, and K. C. Seeger; and an informative three-page discussion by Dr. W. E. Swales of a half-dozen of the Conference's special reports. The papers average about seven pages each, and the complete report is contained in 195 pages. It is basically a research publication, and its coverage undoubtedly reflects fairly accurately the kind of work that is being done and the trends that are evident in the broad field of investigations on coccidiosis.

Dr. George H. Glover, Former Dean, Colorado State College, Fort Collins, is Dead

Dr. George H. Glover, 86, beloved founder and first dean of the Division of Veterinary Medicine, Colorado State College, Fort Collins, died at his home in Colorado, January 11, 1950. His tenure of active deanship extended from 1907 to 1934.

Doctor Glover was a member of a famous graduating class, Iowa State College, 1885, which included those shown in the accompanying photograph. For more than 50 years his work as an educator and livestock hygienist has been outstanding. In 1910 he was honored by his profession when elected to the presidency of the A.V.M.A.

In 1939, he wrote, VETERINARY MEDICINE, 34:408 (July) 1939, "Surely no one can accuse us of having been 'asleep at the switch.' From ox cart and daguerreotype, to 'streamlined' trains and the cinema; from horse dentistry, 'wolf in the tail,' and 'holler-horn,' to conservation of the animal wealth and the public health; from magic to scientific demonstration; from superstition to faith in an orderly universe; from the classic demonstration of Smith and Kilborne to the role of small animal life in the transmission of pestilential diseases. Indeed we might go on indefinitely and always find that comparisons are not odious but enlightening."

Senior Class, Division of Veterinary Medicine, Iowa State College, 1885; Sesco Stewart, M.D., secretary (1895-1902) and president, (1902-03), A.V.M.A.; W. B. Niles, co-discoverer of hog cholera antiserum; E. E. Sayers; George H. Glover, president (1910-11), A.V.M.A.; D. C. Collins and M. E. Johnson.

The new veterinary hospital at the Colorado school which will bear his name is a fitting tribute to a long life of service and vision.

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U. S. Bureau of Animal Industry research workers have demonstrated that eggs held at a temperature of 100°F. for a period of 16 to 18 hours, then cooled to 50°F., and candled will distinguish the fertile from the infertile ones. By this preincubation test the infertile eggs may be discarded for incubation purposes. The fertile eggs, even after a lapse of several days, do not appear to have their viability injured.

Chickens are autopsied every day at a charge of $1.50. This procedure has been followed for many years to my clients' satisfaction.—F. C. Tucker, M.D.V., Claypool, Ind. *Jour. Am. Vet. Med. Assn.*, 116:99 (Feb.), 1950.

*Ann. N. Y. Acad. Sci., 52(4):429-624, Nov. 10, 1949.

POULTRY PRACTICE PROBLEMS

W. R. HINSHAW, D.V.M., Ph.D.
Frederick, Maryland

Why not encourage your poultryman clients to keep feed consumption and mortality records for all ages of birds, by pens or individual groups? For the laying flock, egg records for each pen or house should be added. Such records will alert the client to the first appearance of disease in the flock. He should be encouraged to get in contact with you as soon as the records show an indication of any abnormality.

A suggestion along this line is to have available a stock of record forms with your business card printed on them. There are many such forms made available to the poultrymen by feed companies and extension service departments of colleges and universities. This latter group may be able to give you some ideas on what is best adapted to your needs, since such records are a part of the requirements for cooperative cost account studies conducted by county farm advisers.

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At this time each year a reminder to acquaint poultry raisers with the pullorum disease situation seems advisable. The assistance offered them may save thousands of dollars if advice is given to select source of chicks and poults with care. The best way to do this is to make sure that only the top grades are purchased. These are U. S. Pullorum-Clean, which is the top quality, and U. S. Pullorum-Passed, the next best. Discourage poultrymen from buying either U. S. Pullorum-Controlled or Tested stock, because both of these grades indicate that infection exists in the flocks but that the reactors found have been removed. The other grades indicate that no pullorum disease exists in the flock because no reactors to the test were found. Take time out to explain the meaning of these four government grades to your clients and advise them where the best grades of chicks and poults may be purchased.

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Many conflicting stories about the value of estrogenic hormones for fattening of poultry have been published. Their use has been established as an economic procedure for fattening chickens in some areas. Their projected use for turkeys has been in attempts to finish turkeys for market at an earlier age. Results have not been as encouraging as for chickens and at the present time, estrogen treatment is not recommended for turkeys.

Estrogen treatment of male birds has been erroneously called chemical caponization. This term is not entirely correct since the testes are only retarded and not destroyed. When treatment is discontinued the testes will reactivate, and the bird will again become a normal cockerel. Lorenz (*Nulaid News* 27(6):8 (Oct.), 1949) prefers to call the estrogen treated bird "feminized", rather than caponized. This is because the hormone in the treated bird is replaced by a substance that has the same action as the ovarian hormone. This causes the treated male to act like a hen except for actual egg production.

Two specific feminizing effects are of special practical importance; these are (1) a thickening of the skin, and (2) a speed-up in the rate of fat formation. Both of these improve the appearance of the dressed bird. Two conditions caused by estrogen treatment may make the dressed bird appear less finished or desirable for consumption. These are (1) a pale shrunken comb, and (2) a tendency to bone fragility. Consumer education to overcome objection to these effects of treatment is needed to promote the sale of hormone-treated chickens.

A false impression held by many is that estrogen treatment of chickens increases rate of growth. Actually what happens is fat deposition without any appreciable increase in growth rate, especially in young birds. In older birds which have reached maturity, weight gained and improved meat quality will justify the extra feeding time which is necessary when hormone treatment is given. Estrogens prove a valuable aid in making an edible carcass out of an otherwise useless old cock.

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Very few studies on electrocardiography of chickens have been made, so the recent report by Sturkie (*Am. Jour. Vet. Res.*, 10:168, 1949) is a welcome one. He made from three to six electrocardiograms per bird on 72 White Leghorn females over a period of a year. In his studies, heart disorders accounted for only a few deaths during the year.

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The duration of fertility following a single mating by the same male may vary as much as 14 days for different hens.

VETERINARY PARASITOLOGY

A. O. FOSTER, B.A., M.A., Sc.D.
Beltsville, Maryland

Importance of the Brown Dog Tick

The brown dog tick, *Rhipicephalus sanguineus*, is a "first magnitude"[1] parasite of dogs and an annoying, tenacious pest of kennels and human habitations. Generally, in this country, it has not been regarded as a vector of any disease, with the possible exception of canine piroplasmosis or malignant jaundice which, fortunately, appears to have been rarely and only regionally encountered. Our comparatively complacent view of the real importance of this tick seems to be based mainly on the dubious grounds that the tick rarely attaches itself to hosts other than dogs.

Recently, workers in the Rocky Mountain Laboratory, U. S. Public Health Service, have recovered *Coxiella burnetii*, the infectious organism of Q fever, from a lot of 18 brown dog ticks taken in June 1948 from a dog in Phoenix, Ariz.[2] There is, moreover, a disturbing report from Switzerland[3] that Q fever may cause epidemic abortion in goats. There are, also, new reports of the continuing spread and increase of the brown dog tick.[4]

The aforementioned tick, it will be recalled, is probably not an indigenous parasite of the United States, but is generally believed to have been introduced from countries to the south about 40 years ago. After it was first found in Texas in 1912, the tick spread rapidly until it now appears commonly throughout most of the country with the apparent exception of the northwestern quarter.

The tick in question is well established throughout the world, and is common in tropical and subtropical regions. In parts of the old world, it is a vector of boutonneuse fever, South African tick-bite fever, Kenya fever and possibly other diseases similar to spotted fever. Indeed, research in this country has shown that the brown dog tick, experimentally, is an efficient host for the Rickettsia of spotted fever. The tick is also a suspected host, or has been found to be a suitable host under experimental conditions, for certain protozoan species other than Piroplasma, namely Anaplasma of cattle and dogs, *Hematozoon canis*, *Trypanosoma cruzi*, and *T. christophersi*. It is, finally, a suspected and probable host for the infectious organism of tularemia.

Now that Q fever has been added to this list, there is ample evidence that veterinarians should be especially alert to the possible hazards of the brown dog tick to both human and animal health.

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3. Kilchsperger, G. and Wiesmann, E., Abortus-Epidemie bei Ziegen, bedingt durch *Rickettsia burnetii*. *Schw. Arch. f. Tierheilkunde*, 91:553-556, 1949.
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A carefully controlled study† has gone far toward clarifying the importance of Nematodirus as a sheep parasite. Heavy, experimentally-induced infections reduced the growth rate of lambs and caused diarrhea, inappetence, weakness, and emaciation. The diarrhea appeared within two weeks after infection and lasted from one to two weeks. The effect upon the weights of the animals was more lasting. The infections did not cause anemia and resulted in no deaths. Parasites were lost comparatively rapidly, since only a few worms were present when the animals were autopsied 13 weeks after infection.

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Recent papers on poultry parasites have pointed out that differences in the diets of hens may influence the susceptibility of their chicks to parasitism with large roundworms; that pteroylglutamic acid deficiency lowers the natural resistance of chickens to these parasites; that there is a substance present in liver extract, possibly vitamin B_{12} or the animal protein factor, which is necessary in comparatively large amounts for the normal growth of worms in their hosts; and that ascarids are not able to grow well in chickens on low phosphorus diets, such diets being injurious to both host and parasite.

†Kates, K. C., and Turner, J. H., Observations on the Pathogenicity of *Nematodirus spathiger* in Lambs (abstract). *Jour. Parasit.*, 35:13, No. 6, Sec. 2, 1949.

Codiaeum Variegatum (Croton) Poisoning in a Goat.

C. A. McGAUGHEY, Professor of Veterinary Science, University of Ceylon, Colombo

Codiaeum variegatum, commonly known as croton, is a popular garden shrub in Ceylon. Like the real croton, *Croton tiglium,* the castor plant, *Ricinus communis,* the maniocas, *Manihot utilissima* and *M. aipi, Euphorbia lathyris, E. hibernica* (Irish spurge), *Mercurialis perennis* (dog's mercury), *Buxus sempervirens* (box) and several other poisonous plants, it is a member of the family Euphorbiaceae.

The poisonous properties of croton and castor beans are known to be due to toxalbumins, those of manioca to a cyanogenetic glucoside, those of box to an alkaloid, and of dog's mercury to a volatile basic oil with narcotic properties, (Nicholson, 1947).

As there does not seem to be any record of poisoning by *Codiaeum variegatum,* it was thought that the following account of a case of poisoning by the ingestion of this shrub might prove of interest.

The subject presented was a male Jumnapari goat, about five years of age. The owner, an experienced stockman, had kept the animal since it was a kid. It had enjoyed good health and vigor until about four months before the final fatal illness. On that occasion, it had broken loose from a back yard in which it was usually tethered and had eaten leaves and barks of a hedge composed of *Codiaeum variegatum.* Severe abdominal pain with distention of the rumen had ensued, but the animal recovered after treatment with demulcents and laxatives and was apparently healthy for four months. Two days before death, the goat broke loose again and ate heartily of the croton bushes before he was detected. After a few hours, signs of severe abdominal pain were exhibited with distention of the rumen and passage of blood-stained feces. Urination was suppressed. Despite treatment by the owner with demulcents, the animal died within 48 hours of the onset.

Postmortem Examination

There was some regurgitated ingesta in the mouth, nasal passages and trachea. The lungs showed patchy congestion; the heart was distended with firm clotted blood. The urinary bladder was distended with dark coffee-colored urine (hematuria and hemoglobinuria) and contained two or three calculi about 11x5 mm., also a large number of much smaller calculi about pinhead size. The wall of the bladder was intensely inflamed; the urine had a pungent acrid odor. The kidneys were soft and congested; in the pelves of both there were 12 or more small calculi about 5 mm. long, dark greenish when moist, grey when dry, some conical in shape, some flat and rhomboidal. The lumen of the urethra throughout its length was almost completely occluded by a hemorrhagic exudate. The liver was soft and pale brown, the gallbladder distended with dark green bile, the wall being darkly congested in patches. The spleen was apparently normal. The rumen was full of moist, dark brown, fibrous material in which there were entangled strips of tough central petioles of the croton leaves and also a few of the softer laminae of the leaves; there was a pungent acrid odor. The reticulum contained moist material, the omasum contained dry, powdery brown material and the abomasum dark brown, watery fluid. The lining membrane of the rumen became detached in shreds when rubbed; the mucosa of the abomasum was acutely inflamed as also was that of the small intestine throughout its length; at some portions, the contents of the small intestine consisted almost entirely of blood. The mucosa of the cecum, colon and rectum were acutely inflamed in patches and areas of ulceration varying in size from that of a pinhead up to two inches were observed. The edges of these ulcers were intensely hemorrhagic. The colon contained numerous Trichostrongylus, some adhering to the mucosa, some entangled in the firm balls of feces.

Chemical examination of the calculi revealed that they were composed mainly of phosphates with a small amount of organic matter. The metallic radicle was calcium. Tests for oxalates, uric-acid, urates, carbonates, cystine and xanthine were negative.

Acknowledgments: I am obliged to Dr. R. D. de A. Seneviratne, pathologist to the General Hospital, Colombo, for the report on the composition of the calculi.

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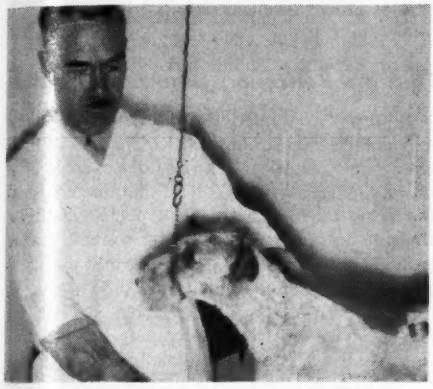
A Method of Restraint

FRANK R. BOOTH, D.V.M., Elkhart, Indiana

For the restraint of dogs for hand trimming or clipping, the use of a small size choke chain as illustrated has proved advantages over other methods formerly employed. A loop of chain is applied well up over the muzzle and



is attached by an S hook, to a chain suspended from the ceiling over the grooming table, with light pressure. Thus the chain is adjustable for variations in the size of the dog.

The operator is allowed freedom to work over the animal's body with a minimum of nuisance of restraint apparatus. Any movement of the dog immediately tightens the chain but in the normal standing position the animal is comfortable. Dogs which object to grooming or which bite are controlled to a large extent. Animals rarely resent the chain after the first few minutes of use and after having been restrained in this manner once will tolerate the method without objection.

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Replacement of Uterine Prolapse*

P. W. UCKO, D.V.M., Clinton, Iowa

The theory of the method discussed is based on the premise that the pressure reflexes of the autonomic nerves in the uterine peritoneum activate the abdominal press during replacement of the prolapsed bovine uterus, even under epidural or general anesthesia. These reflexes can be abolished by peritoneal anesthesia.

The cow is held with a nose-lead; pain is almost absent; few animals will lie down. The prolapsed uterus is lifted by two helpers by means of a shroud-covered board measuring 14x25 inches. The uterus is cleaned. Any prolapsed portions of intestines or urinary bladder are returned to the abdominal cavity by elevating and massaging the uterus and by emptying the bladder with a rubber catheter.

Peritoneal anesthesia is induced by the injection of 100 to 200 cc. of atoxicocain† into the peritoneal cavity of the uterus near its apex. The uterus is held horizontally during injection, then dropped gently to a hanging position and massaged for five to ten minutes for thorough anesthesia. It is then lifted slightly above the vulva and massaged for two more minutes to anesthetize the important line of junction between abdominal and uterine peritoneum.

The board, holding the uterus, is kept slightly above the level of the vulva, and serves as an operating table from which the uterus is returned to the abdominal cavity. After replacement, the organ is filled with a lukewarm (113 F.) antiseptic solution††, which serves as a mild sedative, antibiotic, and detergent, and which straightens any kinks. After a few minutes, the liquid is syphoned off and a few uterine capsules introduced. The cow's hindquarters are kept elevated for a few days by means of a platform. Suturing of the vulva or application of a harness are usually unnecessary. Post-natal infection by malignant edema is common in the author's practice and is prevented by immunization at this time.

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In recent studies on enterophepatitis of turkeys, inoculations of 250 embryonated ova of *Heterakis gallinarum* regularly produced fatal infections in susceptible poults. On the average, turkeys survived 17 days after inoculation. The cecal worm eggs that carried the infectious material were removed from worms collected at random from the ceca of marketed chickens. A measurable degree of immunity to enterophepatitis was demonstrable under controlled conditions. Concerning treatment, results were very promising with two new drugs, namely, 2-amino-5-nitro-thiazole and its pyrimidine analogue.

*Glaettli, H., Replacement of Uterine Prolapse under Peritoneal Anesthesia. *Schw. Arch. Tierh.*, 91:518 (Aug.), 1949. Translation and abstract.

†Atoxicocain is a brand of procaine solution, not the procaine hydrochloride, commonly used. The formula has been supplied through the courtesy of B. Siegfried, Ltd.

††Pharmacological studies on solutions 1 and 2, for distribution here, are in progress.

ABSTRACTS OF LITERATURE

The Functions of Protein in Ruminants

The protein requirements of ruminants vary with their use by the animal. According to Prof. R. Schreiber[11], of the Justus Liebig College of Giessen, these requirements are different for maintenance of life, milk production, fattening, muscular work, and particularly growth. Interesting is the relationship between protein content of dam's milk and weight gain of mammals, as shown in the following table of H. Aron:

Species	Number of days needed until birth-weight is doubled	Protein content in 100 parts dam's milk
Cattle	47	3.3
Goat	20	5.0
Sheep	12	5.6
Swine	8	7.5
Dog	8	9.2
Rabbit	6	15.5

For human beings, the respective figures are 180 and 1.2.

—G. L.

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Complement Fixation Test for the Diagnosis of Leptospirosis

The difficulty in clinical differentiation of leptospirosis is recognized. Positive diagnosis in many cases requires recourse to laboratory procedures. In an effort to simplify laboratory tests for routine use, Randall, *et al.*,[12] outline a complement fixation procedure shown to be specific. It also appears, in the studies of the sera from 21 proved cases of Weil's disease in man reported, that complement-fixing antibodies might be detectable before agglutinins can be demonstrated.

The authors state that Leptospira disappear from the patient's blood during the second week after infection and then appear in the urine. Agglutinins, lysins and complement-fixing antibodies usually begin to appear in the serum of infected persons toward the end of the first week and are present in measurable amounts about the twelfth to fourteenth day after the onset of illness.

Preparation of the antigen and the methods employed are given in detail.

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Fluorine Poisoning Detected in Urine[5]

Fluorine contained in industry exhalations may cause losses among cattle. Changes in their teeth and bones are rarely discovered until the animals are dead. The author analyzed the urine of four animals suspected of being fluorine-poisoned. The fluorine content ranged from 21.3 to 89.6 mg. per liter while the urine of healthy cattle contained only 0.354 to 0.361 mg./liter. Analysis of roughage fed to the sick animals was found to contain 0.81 to 1.25 mg. fluorine per gram dried leaf material. Urine analysis will permit early diagnosis of fluorine poisoning.—G. L.

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Influence of Avian Cholera and Typhoid Vaccines on the Accuracy of Pullorum Tests[13]

Experiments are reported in which groups of turkeys were vaccinated with cholera-typhoid vaccines, or combination vaccines, and then retested for pullorum disease. Such vaccination did not cause the birds to react to the standard antigen test for pullorum.

This does not mean that such vaccination is recommended nor that it has proved effective; but it does show that any reactors found by pullorum tests after the birds have been vaccinated are to be considered reactors to pullorum disease, and not merely reactors as a result of the vaccination.

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Distemper and Sulfonamide Treatment[9]

None of many sulfonamides available at present was of any value in the treatment of canine distemper. References 33.—G. L.

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[11]Schreiber, R., The Nutritional-Physiological Functions of Protein in Regard to the Different Performances of Ruminants. *Deut. Tieraerztl Wochenschr.*, 56:353-356 (1949).

[12]Randall, Raymond, D.V.M., Wetmore, Psyche W., B.A., and Warner, Albert R., Jr., Sonic-Vibrated Leptospirae as Antigens in the Complement Fixation Test for the Diagnosis of Leptospirosis. *Jour. Lab. & Clin. Med.*, 34:1411 (Oct.), 1949.

[5]Krüger, E., Nachweis fluorhaltiger Industrie exhalationen durch Analyse von Rinderharn. (Determination of Fluorine Containing Industry Exhalations by Means of Analysis of Urine of Cattle.) *Deut. tierärztl. Wochenschr.*, 56:325 (1949).

[13]Brooks, Dan L., and Harnden, E. E., Bul. B-338, Okla. Agr. Exp. Sta., Stillwater, Oct. 1949.

[9]Stettes, R., Distemper and Sulfonamide Treatment. *Tierärztl Umschau*, 4:213-18, 1949.

BOOK REVIEWS

Books reviewed in this department and any other books, if available, may be obtained by remitting the published price to the Book Department, Veterinary Medicine, Suite 803 Livestock Exchange Building, Kansas City 15, Missouri.

THE COMPLETE BOOK OF HOME PET CARE, by *Leon F. Whitney,* D.V.M., author of Canine Distemper and the Distemper Complex (*Vet. Med.* 42:275, [July] 1947), Bloodhounds and How to Train Them (*Vet. Med.* 42:318, [August] 1947), How to Breed Dogs (*Vet. Med.* 42:483, [December] 1947), Feeding Our Dogs (*Vet. Med.* 45:97 [February] 1950), etc. 552 pages. Doubleday & Co. Inc., Garden City, N. Y., publishers, 1950.—Price $4.95.

This work, designed for the pet owner, is of much interest also to the veterinarian with a small animal or a caged animal practice. It is outstanding for its pleasing diction and interesting style and for the extent of the field it covers—dogs, cats, rabbits, squirrels, Quadrumana, raccoons, opossums, ferrets, skunks, common caged birds, laboratory animals, and most kinds of fish kept in house and garden aquaria, and a few reptiles and related animals. It is outstanding also for the amount of animal lore and the diversity of information it contains.

Examples of the wide range of subjects include: How to choose a veterinarian; the animal body and how it functions; feeds and feeding for all the animals mentioned in the foregoing, from dogs to fish, snakes, and hamsters; diseases and how acquired; raising orphan animal babies; curious forms of copulation; aerators; lighting for health; deficiency diseases of fish; the food of salamanders; the collection of turtles; handling alligators, etc.

In addition to general discussions of drugs, diseases, parasites, nutrition, care, habits, etc., of a variety of animal pets, the author gives the answers to the 50 questions most often asked of veterinarians by dog owners, by cat owners, by bird fanciers, and by fish enthusiasts. Samples of these questions are: Is there any way to stop an old bitch from dribbling urine? Are all blue-eyed cats deaf? Does only the female produce pigeon milk? How may green water in an aquarium be cleared? What is the life expectancy of a guppy? Do alligators eat on dry land?

Of course, much attention is given to first-aid in accidents and disease and to nursing the ailing or convalescent animal. In the generality, the discussions are such as to raise the prestige of the veterinarian in the minds of pet owners and to increase his opportunity for serving them. Unfortunately, in exceptional cases, the explicit directions for handling emergencies, particularly emergency surgery, will likely encourage some venturesome owners to rely upon their own resources in the treatment of dystocia, some diseases, and a greater number of accidental injuries, until the best period for successful therapy is passed.

—D.M.C.

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MEAT AND MEAT FOODS: PROCESSING AND PRESERVATION FROM MEAT PLANT TO CONSUMER, by *Loyd B. Jensen,* Ph.D., Chief Bacteriologist, Swift and Company, Chicago; Editor, *Food Research;* formerly Assistant Professor of Experimental Bacteriology, Mayo Foundation and Clinic; formerly Instructor in Bacteriology, University of Chicago. 218 pages. The Roland Press Company, New York 10, N. Y., publishers, 1949.—Price $3.75.

This is in no sense a veterinary work, but it is nevertheless of great interest to veterinarians. It gives a fairly complete account of federal meat inspection and much general information about animals from the Pleistocene to the present. And, as the subtitle implies, it contains a complete description of meat processing from the live animal to the consumer's table, and beyond, as food poisoning is exhaustively treated. The objective and pitfalls of each step in turning the flesh of animals into varied food for man is explained.

The author possesses a happy faculty of dramatizing important subjects by citing striking examples which impress the facts upon the memory of the reader. Examples are:

"Reduced to its very fundamentals, the manufacture and subsequent handling of food products may be considered as a race between man and microorganisms to see who will be first to consume the material."

"An examination of a can of pork sausage, more than 15 years old, from a pack used by Admiral Byrd, Antarctic explorer showed a

'slight swell.' The gas in the can was hydrogen, and the contents of the can were absolutely sterile. The sausage was edible and very tender. The fat was not rancid, and the sage spicing was excellent."

"Recently Wilson and Shipp examined, bacteriologically, a can of roasted veal, packed for the English explorer Parry in 1824, and recovered six strains of sporulating bacilli. The strains, which were facultative thermophiles grew at 98 F., and grew well at 131 F., and some grew at 140 F. The survival of viable spores in this can of veal for more than a century appears to have no parallel in bacteriological records."

"Beef hams which were in freezer storage for more than 40 years were compared with fresh frozen beef hams for color, freezer burn, ice crystal structure, thaw drip, histology, microbiology, vitamin and protein evaluation, fat stability and chemical analysis.

"Panels of experienced meat judges voted in blind tests on the tenderness, texture, flavor, juiciness, and over-all preference of the steaks (cut from the beef hams frozen for 40 years).

"Compared with fresh frozen steaks in overall preference, the latter received 20 votes, the 40-year-old steaks received ten votes and eight votes were marked 'no preference.'

"Today some meat laboratories are staffed with highly trained personnel numbering from 100 to 250."

This text is essential to food inspectors.—D. M. C.

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CHEMISTRY OF ORGANIC MEDICAL PRODUCTS, by *Glenn L. Jenkins*, B.S., M.S., Ph.D., Professor of Pharmaceutical Chemistry, Purdue University, and *Walter H. Hartung*, B.A., Ph.D., Professor of Pharmaceutical Chemistry, University of North Carolina. Third edition. 745 pages. John Wiley & Sons, Inc., 440 Fourth Avenue, New York, publishers, 1949. Price: $7.50.

Organized into a rational, systematic classification for purposes of reference, this book discusses briefly a large number of organic chemicals widely used as drugs in human and veterinary medicine. Although it includes much material about the chemistry of the drugs described, the volume may prove useful to veterinarians, as well as physicians and biologists, in practice, particularly those interested in the progress of the pharmaceutical industry and in the application of new drugs in medical practice. Those who read this volume, no doubt, will agree that the authors succeeded in presenting difficult and diversified subject matter in a manner that assists in understanding the close relationship between chemical science and medical application of organic chemistry. Even very recent discoveries, such as newer antibiotics, antihistaminics, sulfonamides, vitamins, amino acids, and enzymes, are described in this valuable compilation of facts; its value is enhanced by the inclusion of extensive literature references.

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BLAKISTON'S NEW GOULD MEDICAL DICTIONARY, *Harold Wellington Jones*, M.D., *Normand L. Hoerr*, M.D., and *Arthur Osol*, Ph.D., editors. First edition. 1294 pages, 252 illustrations. The Blakiston Company, Philadelphia, Pa., publishers, 1949.—Price $8.50.

The preparation of this dictionary, a most ambitious work, demanded exceptional resources of modern scientific information. More than 100 scientists actively engaged in many biological specialties have contributed to the selection and definition of the terms. Some 80 of these contributors, assembled by the editors, are listed in the preface, together with their associations and special fields.

Though Gould's Medical Dictionary, of which five editions have been published since the first in 1890, constituted the basic framework of this new dictionary, authors have, drawn upon their own background of teaching and practice and the current usage and nomenclature employed in the modern editions of books and publications in the field of biological sciences, to develop a completely new reference work. The final result is a modern comprehensive dictionary of the terms used in all branches of medicine and allied sciences including medical physics and chemistry, dentistry, pharmacy, nursing, veterinary medicine, zoology and botany, as well as medicolegal terms.

The users of this dictionary will find the method of arrangement convenient and concise. Entry words, abbreviations, etc., are set off in boldface type for clear separation, with definition text slightly indented. Pronunciation is set off understandably and, where desirable, phonetic respelling for pronunciation follows parenthetically. Where there is more than one distinct meaning or use of a term, definitions are numbered, the most inclusive presented first.

This new medical dictionary, combining features of modernism with numerous innovatory helps, will prove popular with veterinary practitioners and students.

FOLLUTEIN SQUIBB

in the treatment of

CYSTIC OVARIES

In an encouragingly high percentage of cows, nymphomania (frequent or constant heat), or failure to come into estrus, due to cystic ovaries, responds to hormonal therapy with FOLLUTEIN* SQUIBB.

Morbid sexual desire in cows, preeminently caused by ovarian cysts which fail to rupture in the normal manner, tends to recur when cysts are ruptured mechanically. When one 10,000 unit intramuscular injection of Follutein Squibb is given, the majority of cows treated show a marked reduction in the size of ovaries—a normal estrus cycle is established in non-breeders. Cows usually become quiet in 24–48 hours after treatment.

The results of treatments with Squibb Follutein and two other products—dried sheep pituitary extract and pregnant mare serum—are shown in the box on the opposite page.

In reference to these treatments, an Annual Report[1] of the New York State Veterinary College at Cornell has this to say:

"All three products have value and have been employed in cystic ovaries in cattle but chorionic gonadotropin (Follutein) in our short uncontrolled experiments has been exceptionally useful, provided no serious pathology existed other than cystic ovaries."

Follutein Squibb is a sterile preparation of chorionic gonadotropin, the anterior pituitary-like sex hormone isolated from the urine of pregnant women. The dose is 10,000 units. Inject deep into a muscle. Follutein is supplied in 10,000 unit (one dose) packages, with diluent.

Reprints on hormonal therapy are available upon request. E. R. SQUIBB & SONS, *Veterinary and Animal Feeding Products Division,* 745 Fifth Avenue, New York 22, N. Y.

*Trademark [1]1946-47, Number 27A, pages 113-114

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